ELECTRICAL REVIEW

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Voluntary Fuel Economy

Achievements in Home and Industry

THOSE of us who have consistently maintained that equitable fuel rationing was administratively impracticable are cheered by Major Lloyd George's statement that it is not intended to change over from voluntary to compulsory fuel saving. The people have shown their appreciation of the need for economising in fuel consumption, and the weather has been sympathetic too, but there is no occasion for thinking that efforts can be slackened off. The margin is still a meagre one and would soon disappear if there were a reversion to the former careless use.

Efficiency Committee's Work

In the domestic sphere only general exhortation and advice can be employed, but in industry, where the scope for saving is still tremendous, attention can be paid to individual works. A report on the activities of the Fuel Efficiency Committee, issued by the Ministry of Fuel and Power, amplifies the statement dealt with in the *Electrical Review* of January 29th (p. 153) and shows the methods adopted for assisting industrialists to improve their fuel-consuming arrangements.

Through the Ministry's Regional Offices qualified experts provide a combustion engineering advice service and there are Regional Committees with panels of engineers who visit and advise industrial concerns on steam-raising problems. This is backed up by the publication of technical bulletins on steam-raising and the use of heat and power in the factory.

These bulletins cover a wide range of subjects. Apart from setting forth means of securing economy by the proper adjustment and operation of plant, they deal with the institution of bonus schemes ; the appointment and responsibilities of fuel watchers ; fuel economy by saving electricity ; and the assessment of fuel and power costs.

Another very important and practical branch of the work is the training of management and boiler-house staffs by means of lectures and demonstrations at about seventy centres throughout the country. Trade and research organisations have been induced to set up a Fuel Efficiency Committee within each main group of industry to deal with the special problems of that group.

Two Thousand Factories Visited

Up to the middle of December last the official and part-time voluntary investigators working for the Regional Committees had visited nearly 2,000 factories with an aggregate annual consumption of eight million tons of coal and as a result it is confidently expected that this consumption will be reduced by 10 per cent.

Although the primary object of electric power stations is to produce energy with the least expenditure of fuel, even power engineers may find means of effecting further economies. The most likely direction is the improvement of load factor and endeavours are being made by the Ministry and the electricity supply industry to induce domestic and industrial

consumers to keep demands off the morning peak. This point was raised by Mr. J. N. Waite in a recent fuel economy discussion at the I.E.E. when he gave some impressive figures of the possibilities.

This is all good work and is making a substantial contribution to the winning of the war. But it goes even further than that. Waste is deplorable whether in war or peace ; therefore it is very desirable that these educational methods shall be continued after the war when so much will depend upon efficiency in every direction.

The E.I.B.A. in Wartime

IN many directions the work of the Electrical Industries Benevolent Association has been increased by the war. A number of special cases are mentioned in a letter which we have received from the president (Mr. E. E. Hoadley) and the chairman of the Court (Mr. J. N. Stephens). At the same time the Association has suffered a severe loss of income due to so many subscribers being on war service and to other wartime causes. In an endeavour to make up some of this loss the Association appeals to present subscribers to do their best to send in their subscriptions promptly and draws the attention of non-subscribers to the beneficent *personal* service which it renders to the unfortunates of the electrical industry and their dependants. Cheques for this worthy cause should be sent to the Secretary, Northcourt, Leighton Buzzard.

Bus-Zone Protection

SINCE items of generation and distribution systems are protected against faults, in logic the focal point—the busbars and ancillary apparatus—should be at least as effectively safeguarded. In practice, the question has been whether a heavy insurance premium should be paid to cover a relatively remote contingency, at the same time introducing a risk of unwanted tripping of circuit-breakers. Yet the consequences of a rare busbar failure become more serious as the possible fault kVA increases. There are, however, good grounds for claiming, as Messrs. M. Kauffman and W. Szwanda did in their paper before the I.E.E. Transmission Section last Friday, that the risk of inadvertent operation has now been reduced to negligible proportions.

Field Experience Needed

ALTHOUGH the discussion that followed the reading of the paper indicated a consensus of agreement on the merits of bus-zone protection for large generation and distribution stations, there was much less unanimity about smaller substations and about the most suitable technical means to adopt in any case. Such points will be satisfactorily settled only after prolonged operating experience under diverse conditions. There still remains the problem of existing stations without this protection. The authors' suggestion that designs for new plants should at least make provision for appropriate schemes is one that will probably be increasingly adopted.

Indian Rubber

WITH 90 per cent. of the world's rubber resources in enemy hands, leaving only about 188,000 tons a year available to the United Nations, the development of all potential rubber areas is of outstanding importance. Possibilities in Ceylon and India are being studied by a mission from this country. Already the two countries (mainly Ceylon) produce about 118,000 tons a year. It is estimated that by earlier tapping another 37,000 tons can be made available, but only at the expense of destroying 20 per cent. of the plantations in two years. If the necessary labour can be obtained it is proposed to go ahead with this scheme. Whether success is achieved or not, this decision forces upon the attention of all concerned the absolute necessity for care and economy in the use of rubber.

Hire-Purchase Ban

THE Board of Trade Order prohibiting the hire-purchase of price-controlled goods should not, we think, affect electrical business to any great extent. Domestic electrical appliances in general are price-controlled, but in view of their scarcity and the fact that most of the smaller appliances are not of a "hire-purchasable" nature it seems that only rarely will any question arise. So far as electricity supply authorities are concerned the Order makes no difference, as hire-purchase schemes were suspended by the Electricity Commissioners last April. Existing contracts are not affected by the Order.

Fertiliser Manufacture

How Calcium Superphosphate is Produced

One of the important raw materials now available to us from North Africa is phosphate rock from which calcium superphosphate, an agricultural fertiliser, is obtained. In this article the manufacturing processes are described

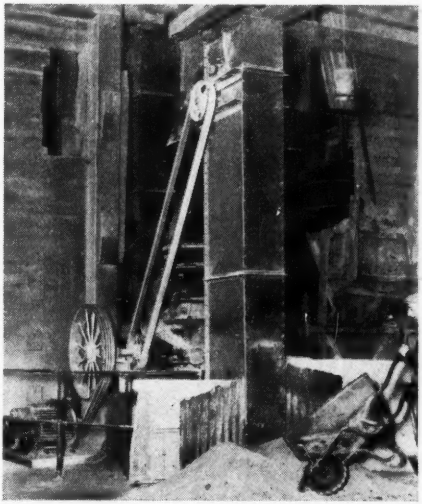
APART from military considerations the recent operations in North Africa are of great importance on account of the various natural resources of the country that are now no longer available to the enemy, and are instead at the disposal of the Allied Nations. One of the most important of these materials is the phosphate rock from which the valuable agricultural fertiliser, calcium superphosphate, is produced. Before the Allied occupation approximately one million tons of North African phosphates was being shipped annually, most of it finding its way to Germany. Diverted to Great Britain, this new source of supply will save a considerable amount of shipping—our supplies recently have had to come all the way from Florida, U.S.A.

The manufacture of calcium superphosphate for use in agriculture dates back to a century ago in 1842, when Sir John Bennett Lawes, after experiments with treating bones, spent animal charcoal and finally mineral phosphates with sulphuric acid, took out a patent for its manufacture. Production on a large scale was commenced a year later at a factory at Deptford Creek, and business expanded so rapidly that in 1857 a large site was acquired at Barking Creek. Here was erected the factory in which the public company, the Lawes Chemical Co., Ltd., which took over the business in 1872, has continued to manufacture artificial manures without a break right up to the present day.

Though the basic process of production remains the same, methods have of course progressed considerably. The company has kept well abreast of modern developments and has adopted mechanical and electrical aids. Recently a completely new continuous superphosphate plant has been installed which is remarkable not only for increase in output but also for the phenomenal cleanliness and lack of fumes compared with the old methods.

Apart from the initial feeding of the grinding plant and the final dispatch of the finished product there is no manual handling, only two operatives in fact being required to work a plant capable of turning out 10 tons of superphosphate per hour.

The raw rock which may be of any size up to 6 in. cube, is fed into the boot of an elevator which raises it to a preliminary rotary crusher; a single 15-HP motor running at 970 RPM is arranged to drive both the crusher and elevator. In this machine it is reduced to half-inch or finer, and discharged to a 12-in. vertical circulating elevator and worm conveyor (both driven by a 7½-HP, 720-RPM motor) to an air separator. The oversize falls back into a ring and roller mill, where it is ground, and gravity fed back to the circulating elevator once more to mix with the incoming material and so up to the air separator again, thus forming a complete circuit.



The raw phosphate rock is put into this elevator, which feeds it into the grinding plant

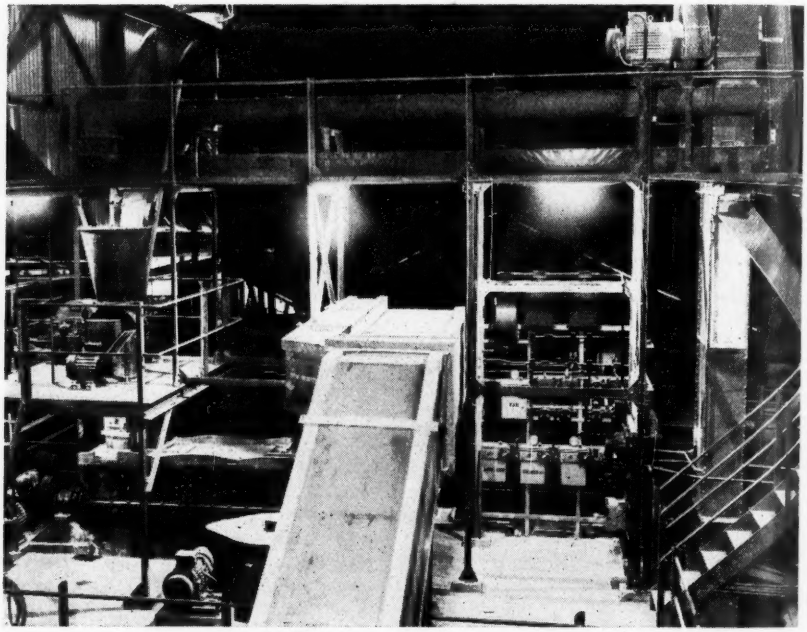
The air separation system is extremely simple. A current of air created by a 9-ft. diameter fan (15-HP, 725-RPM motor) is made to pass through a falling screen of material, from which it carries away all particles below a certain size, allowing the larger ones to drop through. The material is fed through a chute in the top, a small deflector plate mounted on the centre shaft preventing any large lumps from getting into the working parts.

The material falls on to the distributing plate directly under the inlet hopper and is then flung out by centrifugal force, forming a circular screen of falling material. The various deflecting rings loosen the fine from the coarse material, while the fan meanwhile creates a regular circulation of air through the falling screen, picking out the fines and whirling them round in the outer casing where the ordinary action of a cyclone separator comes into play. The dust is flung against the outer casing, gradually separates from the air and falls finally through the outlet spout at the bottom.

The oversize, too large for the air current to pick up, falls into the central hopper and is discharged through an outlet and returned by a chute to the ring and roller mill. The actual fineness of the material separated depends, of course, on the speed of the air current through the falling screen of material, and is a matter allowing of easy adjustment.

The fines (approximately 80 mesh and under) from the air separator pass *via* worm conveyors through a Simons automatic weigher, which keeps an account of all the phosphate ground, before being elevated to two storage hoppers with capacities respectively of 100 and 200 tons. The weighing plant and all the conveyors associated with it are driven by a 7½-HP, 720-RPM motor.

From these hoppers the fine phosphate is taken by means of worm feeders to a chain and bucket elevator which supplies another worm conveyor feeding the " den " or mixing plant where the superphosphate is produced. One motor of 5 HP running at 1,440/30/RPM and two of 10 HP (965 and 720 RPM, respectively) work these conveyors and elevator. A return conveyor takes any overflow back to the storage hoppers. On the same platform as the phosphate feeder and working in conjunction with it is an acid feeder which automatically controls the flow of acid required for a given amount of phosphate. Both the phosphate and the acid discharge into a continuous mixer whence the mixture falls in semi-liquid form into the den.



A general view of the top of the " den," showing electrical equipment, together with ground phosphate conveyors, phosphate and acid feeders, continuous mixer and fumes exit

The Moritz-Standaert den employed comprises a concrete cylindrical container, with a cast iron central mandrel, rotating slowly at a variable speed on supporting rollers. The superphosphate coming from the mixer fills the annular space in the container formed between the outer concrete wall and the cast iron central mandrel. This newly made

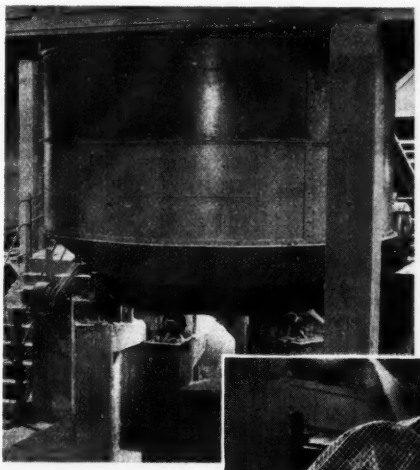
superphosphate is prevented from spreading back to the cutter by a curved partition. It hardens during the rotation of the den and forms a ring of superphosphate which regularly comes into contact with the cutter and is divided into fine even particles. During the cutting out process a powerful fan draws air through the den and removes the steam given off during the chemical reaction. To avoid possible damage to the plant the cutter and den are interlocked so that if the former stops, the den stops also. Fluorene gas is also liberated during the chemical reaction, and is drawn off by means of the fan already referred to (10-HP, 965-RPM motor), which discharges into a toxic condenser.

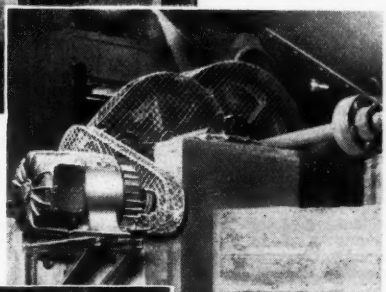
The container makes one rotation in 2¾ to 8 hours, according to the quantity to be manufactured and the quality of the raw phosphate used. The power required for rotating the container when full is only about 0·8 HP, and for the container, the cutter and the fan together it is only about 10 HP.

It is calculated that up to the arrival of the superphosphate on the conveying band 1·7 kWh per ton of superphosphate is required. Only one operator is required to look after the whole of the den plant, while the grinding plant, too, comprising two separators, two mills and auxiliary plant is similarly supervised by a single operator.

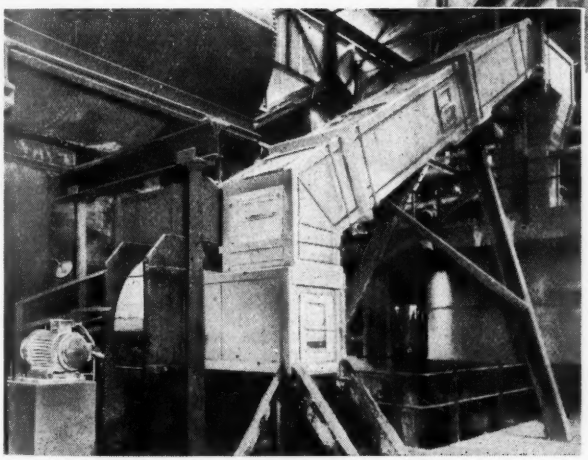
After being cut out of the den the superphosphate falls on to tray conveyors and is dry enough to be carried by rubber belts to store. The modernising of the grinding plant and complete new den plant was carried out by the Sturtevant Engineering Co., Ltd. Lancashire Dynamo motors are employed throughout and the control gear is mainly of Allen West and Electrical Apparatus Co. construction.

We should like to thank the Lawes Chemical Co., Ltd., for granting us facilities to visit its works, and also the Sturtevant Engineering Co., Ltd., for its assistance.





The "den" or mixing plant where the superphosphate is produced (above) and the motor driving it (right). Below is shown the fume fan



Women Electricians

Training at Government Centres

IN a circular letter to electricity supply undertakings the Electricity Commissioners again urge the necessity of engaging women to take the place of men called up for service with the Forces. They realise that the principal difficulties are the restrictions placed by the Factory Acts on the employment of women and the inability of local employment exchanges to provide trained women.

With regard to the first, some relaxation is provided by the Electricity Supply (Hours, Safety and Welfare) Order, 1943, to which reference was made in last week's issue. As regards training, the Commissioners have been furnished by the Training Department of the Ministry of Labour and National Service with particulars of the various centres in different parts of the country at which training in a number of trades is given. The information is summarised in an appendix to the Commissioners' letter. It is seen that at present only six centres have regular electrical classes, Hounslow, Leicester, Letchworth, Sheffield, Southampton and Wallsend, but that is not to say that if circumstances warranted it such classes would not be set up at centres in other parts of the country.

Centres may be prepared to arrange for special classes of training in domestic appliance repairs, meter testing and meter repairs, etc., provided a sufficient number of trainees can be enrolled at a time. In this connection consideration should be given to the joint requirements of a group of undertakings and the undertakings might be asked to lend the Centres such items as meters, etc., in which training is to be given.

Undertakings are advised to consult the managers of the Training Centres who will give advice on their problems and on such questions as billeting and lodging allowances during training and the engagement by electricity undertakings of women already in training.

Methods of Training

The facilities available at Government Training Centres for the training of women, as well as men, to meet the demands for labour in the electrical industry are by no means as well known as they should be. Especially are employers backward in availing themselves of the opportunity which the Centres offer for trainees (either "green labour" or employees needing stepping-up) to be given specially designed instruction in the actual work for which they will be required. "Training to employers' requirements" is in fact the policy which the Ministry of Labour and National Service has adopted for this side of its work.

The system of training adopted is, of course, much more intensive than that to be found in industrial establishments, being in somewhat the same relationship as a "crammer" to a school. No wild claims are made for the results achieved but the Centres do succeed without question, as we have ourselves seen, in producing trainees of exceptionally high degree of skill in specialised duties. Although the average period is sixteen weeks, a course may range from as short a time as four weeks to as much as twenty weeks or even longer.

No matter what job the trainee is being prepared for, she first receives a basic course covering cable jointing, sweating of lugs and sockets, wiring in v.i.r., t.r.s. and lead-covered cable, cutting and screwing of conduit, bending and erecting, connecting to distribution boards, main switches, the use of instruments (voltmeter, ammeter, ohmmeter, Wheatstone bridge and "Megger"), fault location, repairing and connecting up AC and DC motors and starters, field regulators and transformers, Both practical and theoretical tuition is given by thoroughly qualified instructors, who are recruited from industry and themselves undergo a special course of training at a staff college where they are "taught how to teach." A feature which is particularly striking to a visitor to a Centre is the remarkable spirit of comradeship that exists.

Payment of Students

Each month the students undergo tests in both practical and theoretical knowledge. Marks are given according to progress and if satisfactory an increment is made in their wages, raising them from 50s. a week (for a woman over 21) to 54s. Trainees being "stepped-up" receive their normal wages from their employers. The Ministry of Labour makes arrangements about billets and in the case of widows, etc., having homes to keep going, a lodging allowance of 24s. 6d. is paid.

Students are selected for their high standard of intelligence and education and provided the work does not call for very heavy physical effort it has already been found from employers' experience that women can carry out successfully many electrical jobs hitherto thought unsuitable for them. At a Centre in the London area which we visited recently we saw girls being trained for house wiring, welding, meter testing and repairing, and repairing of domestic appliances. Incidentally the last-mentioned, who will take up work with the Walthamstow Electricity Department, provide an example of the way "immobile" women can be utilised, since all of them, though having homes in Walthamstow, have been able to make arrangements to train at the Centre for the comparatively short period (three months) of the course. Other specialised courses cover Air Ministry aerodrome maintenance work (including work with special aerodrome lighting equipment) and Admiralty work (including electrical inspection). A number of "Wrens" are also now being trained in electrical work.

E.D.A. Annual Meeting

The twenty-third annual general meeting of the British Electrical Development Association is to be held at the Connaught Rooms, London, W.C.2, on March 19th, at 3 p.m. The meeting will be preceded by a luncheon.

Short-Circuit Values

An Application of Symmetrical Component Analysis

By T. F. Wall, D.Sc., M.I.E.E.

ANY unasymmetrical three-phase current system may be analysed into three symmetrical systems, *viz.*, (i) A symmetrical three-phase current system of which the time-vector diagram rotates in a counter-clockwise direction ; (ii) A symmetrical three-phase current system of which the time-vector diagram rotates in a clockwise direction ; (iii) A system of three single-phase currents co-phasal and of equal magnitude.

That this theorem does in fact hold is readily seen for many important cases which occur in practice. For example, in fig. 1 is shown a single-phase current of RMS value I amperes and such a current represents the most unsymmetrical form of a three-phase current system. In fig. 2 are shown the three symmetrical component systems as defined in the foregoing and it is at once seen from an inspection of these diagrams that the resultant of the three component systems is identical with the single-phase current of fig. 1. It is helpful to note that in the general case, if $I_1 : I_2 : I_3$ are the respective vectors of the unsymmetrical system, the component (iii) of the foregoing analysis is given by,

$$I_{ao} = I_{bo} = I_{co} = \tfrac{1}{3}(I_1 + I_2 + I_3) \quad \ldots (1)$$

so that for the single-phase current of fig. 1 $I_{ao} = \frac{1}{3} I$ and, consequently, $I_{aD} = I_{aR} = I_{ao} = \frac{1}{3} I \quad \ldots (2)$.

The application of this theorem very greatly simplifies calculations relating to unsymmetrical systems and a good example of its usefulness is found in the case of unsymmetrical short-circuits of three-phase systems.

In fig. 3 is shown diagrammatically, a short-circuit on one phase of a three-phase generator. The induced EMF's due to the field excitation are respectively, $E_a : E_b : E_c$ and assuming that the resistance of the circuit is negligibly small, the current in each phase will be 90 deg. behind the respective EMF's to which they are due. The short-circuit current in the case of fig. 3 will be a single-phase current and, consequently, may be analysed into the symmetrical systems shown in fig. 2. The simultaneous equations for the conditions which hold in each phase may then be written :

$$\left.\begin{aligned} E_a &= j\,I_{aD}\,X_1 + j\,I_{aR}\,X_2 + j\,I_{ao}\,X_o \\ E_b &= V_b + j\,I_{bD}\,X_1 + j\,I_{bR}\,X_2 + j\,I_{bo}\,X_o \\ E_c &= V_c + j\,I_{cD}\,X_1 + j\,I_{cR}\,X_2 + j\,I_{co}\,X_o \end{aligned}\right\} \quad \ldots (3)$$

so that, from (2).

$$E_a = j\,I_{aD}\,(X_1 + X_2 + X_o) \quad \ldots (4)$$

where X_1 ohms per phase is the synchronous reactance of the generator, that is, the reactance corresponding to the direct rotating current system of fig. 2 (*a*), X_2 ohms per phase is the reactance corresponding to the inverse rotating current system of fig. 2 (*b*) and X_o ohms per phase is the reactance corresponding to the single-phase system of fig. 2 (*c*). When the values of these reactances are known the short-circuit current becomes completely defined by equation (4) and the vector diagrams of fig. 2.

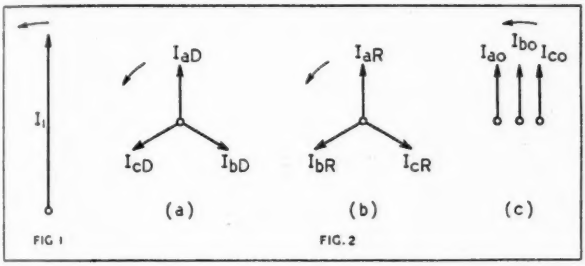


FIG. 1 FIG. 2

In order to determine the pressures V_b and V_c at the terminals of the open-circuited phases, it is to be noted that the EMF's E_b and E_c can only give rise primarily to currents and pressures which correspond to the direct rotating system of fig. 2 (*a*), so that, for the terminal pressure V_b, the following simultaneous equations will hold :

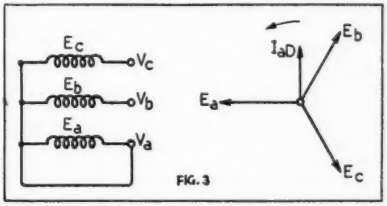


FIG. 3

$$\left.\begin{aligned} E_b &= V_{bD} + j\,I_{bD}\,X_1 \\ O &= V_{bR} + j\,I_{bR}\,X_2 \\ O &= V_{bo} + j\,I_{bo}\,X_o \\ V_b &= V_{bD} + V_{bR} + V_{bo} \end{aligned}\right\} \quad \ldots (5)$$

A similar set of equations will also hold for

the terminal pressure V_o. Hence, for the terminal pressures V_b and V_c respectively:

(i) The three-phase direct components are: $V_{bD} = E_b - j I_{bD} X_1$: $V_{cD} = E_c - j I_{cD} X_1$.

(ii) The three-phase inverse components are: $V_{bR} = -j I_{bR} X_2$: $V_{cR} = -j I_{cR} X_2$.

(iii) The single-phase components are: $V_{bo} = -j I_{bo} X_o$: $V_{co} = -j I_{co} X_o$.

From these results it is seen that the three symmetrical systems for the terminal pressures

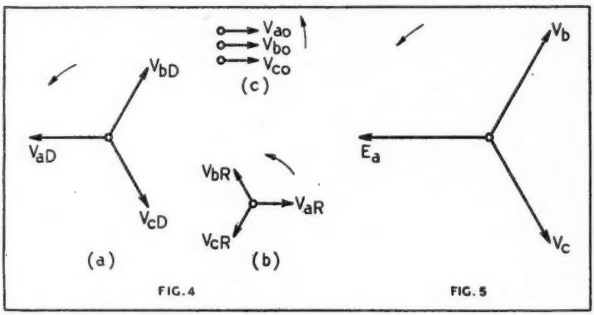


FIG. 4

FIG. 5

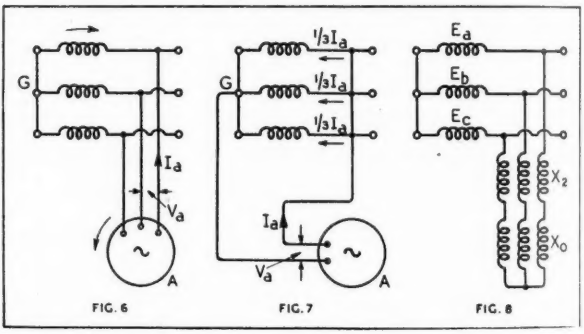
are defined by the vector diagrams of fig. 4, which incidentally give the pressure at the short-circuit phase terminal to be $V_a = 0$. The vector diagram of fig. 5 shows the terminal pressure vectors V_b and V_c in their relationship to the EMF vector E_a. A further relationship which is obtained by adding the equations (3) is $V_b + V_c = -3 j I_{ao} X_o$ . . . (6).

As already stated, the reactance X_1 corresponds to the direct rotating systems of the armature reaction that is to say, it is the normal synchronous reactance per phase of the generator and can be measured by well-known standard methods.

The reactance X_2 corresponds to the inverse rotating system of the armature reaction (fig. 2 (*b*)) and this quantity may be measured by means of the arrangement shown in fig. 6. The generator *G* under test is running at its normal speed with its field circuit closed but with no field exciting current. Connected to the terminals is an auxiliary generator *A* which is excited and supplies three-phase current to the generator *G*. The connections of the auxiliary generator are such that the phase sequence is opposite to that of the generator *G*, *i.e.*, the rotating magnetic field in the generator *G* and due to the current supplied by *A*, has the same speed but runs in the opposite direction to the rotor of *G*. If then, the current per phase supplied by *A* is I_a amperes, and the line pressure is V_a volts, the inverse reactance will be given by the relationship $X_2 = \frac{V_a}{\sqrt{3} I_a}$ ohms per phase . . . (7).

The reactance X_o corresponds to the single-phase components fig. 2 (*c*) and may be measured by the arrangement shown in fig. 7. In this case, the three terminals of the generator *G* are connected together and a single-phase current is supplied from the auxiliary machine *A*. If then, I_a amperes is the current supplied by *A*, the current taken by each phase of the generator *G* will be $\frac{1}{3} I_a$ amperes. If V_a volts is the voltage across the terminals of *A*, the reactance X_o will be given by the relationship $X_o = \frac{V_a}{\frac{1}{3} I_a}$ ohms per phase . . . (8)

When the values of the reactances $X_1 : X_2 :$ and X_o respectively are known, then equation (4) shows that the direct rotating-current system can be measured by connecting a balanced three-phase reactance of $X_2 + X_o$ ohms per phase across the generator terminals as shown in fig. 8.



If E_a volts per phase represents the generator EMF, the balanced three-phase current supplied to the reactance load of fig. 8 will be $I_{aD} = \frac{E_a}{X_1 + X_2 + X_o}$ amperes per phase, since the reactance X_1 is comprised in the phase windings of the generator armature.

Quality Control

Its Application to Production Engineering

By H. Rissik, A.M.I.E.E., F.R.Stat.S.

THE statistical method of controlling product quality during manufacture, originated in 1922 by Dr. W. A. Shewhart of the Bell Telephone Laboratories, has until comparatively recently made little headway in the engineering industry. Moreover, apart from electric lamp manufacture and certain branches of the textile and chemical industries, it is only in the sphere of agriculture that statistical methods as such have seen any extensive application.

For this there is probably a very good reason. Agricultural endeavour is notoriously at the mercy of variable factors whose influence it is difficult to assess quantitatively and whose selection or elimination it is even more difficult to control for experimental purposes. The statistical techniques associated with the name of R. A. Fisher, however, have revolutionised our approach to agricultural research during the past three decades and have contributed very largely to the lead which Great Britain holds in this important field. In the textile industry, on the other hand, the manufacturing techniques developed since the industrial revolution have become less a matter of individual craftsmanship and more a question of technology. (This is perhaps even more true of such a highly mechanised field of production as the chemical industry.) As the technological factors in production become dominant, so the quality of the product comes under the control of routine processes which can be specified in exact terms. Nevertheless, there remains a residuum of unknown factors giving rise to uncontrolled variations in product quality, and it is precisely here that statistical methods of investigation and process control have proved invaluable in obtaining a better and more uniform product.

Statistics and Engineering Practice

The engineering industry comes at the very end of this scale—the scale of rising mechanisation, process specification, and elimination of individual craftsmanship. The last world war dealt a death blow to the old engineering craftsman, whose skill and knowledge made this country at one time "the industrial workshop of the world." Instead, there arose the new tradition of mass production, with its own specialised skills at the higher organisational levels and its use of semi-skilled and even unskilled labour as the operative factor in the new production processes. During the uneasy interregnum of the last twenty years all the emphasis in production has been placed on "methods," whereas in the past it lay on "workmanship." It was felt, therefore, that the new engineering automatically took care of the quality of the product along with the quantity. It was not thought that uncontrolled factors of any importance to product quality lay concealed in the superlatively mechanised and, at the same time, highly precise manufacturing processes that characterise modern "production engineering."

In the event this rather complacent view has proved to be false. Hence the emphasis to-day is on "methods" plus "workmanship"; that is to say, on quantity *and* quality. This was in fact the burden of a recent parliamentary speech by Mr. Lyttelton. The production drive during the present era of "total war" is manifestly two-pronged—*more* output, and *less* waste of materials, man-hours and machines. It is in strengthening the second prong of this vital drive that statistical methods, already of proved service in other industrial fields, have recently come to the aid of the engineering industry.

Quality Control as a Production Aid

The statistical method of controlling product quality during manufacture—a technique which has come to be known simply as "quality control"—is finding an increasingly widespread and successful application in production engineering. Wherever it has been applied its first effect has been to reduce not only scrap but also, and much more important, the productive effort wasted in making semi-faulty material and having to correct it afterwards. In some cases this desirable result has been achieved with less aggregate inspection effort per unit of output, for quality control tends to remove the deadweight on production of 100 per cent. inspection between process operations. This deadweight is a relic of the recent past, with its emphasis on production methods and its implicit view of inspection as a non-productive screening operation for sifting out the bad from the good.

Quality control, then, makes inspection an essentially productive function. It anticipates faulty manufacture and points the way to corrective action *before* the defective work

is actually produced. That is its chief claim to consideration by engineers interested in production—a claim, moreover, which is no longer in dispute. But the essentially productive nature of inspection under a system of quality control leads to important secondary effects. Sometimes it is these effects, rather than the principal result of a consistently better quality product, which have given a manufacturing organisation reason to proceed with more ambitious applications of the quality control technique.

Comparison of Performance

In so far as the so-called quality control chart furnishes a graphic running commentary on the production process to which it relates, it brings to light many of those factors of uncontrolled variation that otherwise lie concealed and in consequence remain unsuspected. Thus the control chart provides a ready means of comparing, for example, one machine with another, or its present with its past performance. Its evidence, too, enables one to judge objectively between individual toolsetters, operators or groups of operators. Moreover, it leads at once to a reasoned appreciation of the relationship between the manufacturing tolerance laid down by the designer and the inherent accuracy of the production process as devised by the planning engineer.

This relationship appears on the quality control chart as a spatial relation between the "tolerance limits" specified and the "control limits" obtained. Its interpretation is of very great practical importance for it determines whether or not the production process is able to meet the specified manufacturing tolerance. If not, then either the tolerance must be increased or else the process must be changed to give a higher degree of accuracy. (Failing one or other of these two possibilities, the only remaining alternative is to accept the situation from the production standpoint and to revert to a 100 per cent. screening inspection of the product for sorting out the defective items produced.)

Rational Basis

The control chart, therefore, provides a rational basis on which the quality control method can act as a direct aid both to engineering design and to production planning. In fact, for those who have had some experience with quality control in the engineering field, it is this aspect of it which has the most technical appeal and which leads sooner or later to a wider appreciation of the many other, more refined, statistical methods available to the engineer in tackling production problems. The principal function of quality control as part of a factory routine, *viz.*, the prevention or minimising of defective product, is one which makes its appeal more to the management and, of course, to the inspection department whose duty it is to administer the quality control system in use.

Developments in Great Britain

Since public attention was first directed to the importance of quality control to wartime production by the special joint meeting of the three senior Engineering Institutions convened last April (see *Electrical Review*, April 17th, 1942, p. 497) the advance made in the applications of this new technique has been considerable. More than a dozen well-known engineering firms are now using it to a greater or lesser extent in their machine shops, with proved benefit to their production, and one of these firms had already established it as a machine-shop routine by the beginning of last year. A further score of firms are known to be applying quality control experimentally to some of their more troublesome production processes, whilst close on a hundred more have been sufficiently impressed with the possibilities of the method to send their representatives to one or other of the many specialised lecture courses which have been held in technical colleges and elsewhere during the past six months for the benefit of local industry. So far, fifteen of these courses have been held, including a three-day teachers' conference in London last October, at which the aggregate attendance has exceeded 1,400.

As a result of such widespread acceptance of quality control technique by the engineering industry and of the direct experience of it which many engineers have already gained, interest in the more technical features of the method has grown and with it the desire to understand rather more of the statistical background than is given in such standard guides to the subject as B.S. 1008/1942 and B.S. 600R/1942. To meet this particular need, and to cater for the demand which will arise sooner or later for a discussion of statistical methods in general as applied to engineering practice, is, however, a matter more for a professional body representing the wider interests of statistical science than for an engineering institution whose interests naturally lie, in the main, elsewhere.

Royal Statistical Society Group

It was therefore appropriate for the Royal Statistical Society to have felt that the pioneer work in quality control which has been and is being undertaken by one or two of its Fellows should be followed up by the opportunity for organised discussion of the practical aspects of this subject. This view has been given official expression by the recent formation of an Industrial Applications Group under the chairmanship of Dr. E. S. Pearson, author of the original B.S. 600, published in 1935 and now out of print, which dealt so admirably with the

industrial applications of the statistical method. The aim of this new group of the Royal Statistical Society is to foster the informal discussion of technical questions relating to quality control and other more advanced statistical methods in industry ; of the statistical method and its interpretation generally ; and of views on the merits of alternative statistical procedures in tackling industrial problems.

Control Limits *v.* Tolerance Limits

The subject chosen for discussion at the opening meeting of the group, held recently in London, was " the relation between design tolerances and ' control limits ' in manufacture," an important technical aspect of quality control to which we have already referred. Dr. B. P. Dudding introduced the subject in a general way to the fifty engineers and half dozen statisticians present, and pointed out the distinction which had to be made between a statistically uniform or " stable " product and a product which might be technically satisfactory but was nevertheless the outcome of an uncontrolled process.

The writer then followed with a brief account of the way in which the relationship between tolerance limits and control limits was commonly interpreted in quality control work in the machine shop, in the course of which he explained the influence of the " control ratio " on the proportion of defective items produced under stable process conditions. He went on to deal with one or two typical quality control problems taken from actual experience, making use of lantern slides and diagrams, and discussed in detail the important case of setting control limits on the quality control chart when the inherent accuracy of the process is high (*e.g.*, an indexing or multi-spindle automatic) and the specified tolerance range is wide. This is a case which often occurs in practice where, for example, allowance has to be made for tool wear or for long-period process fluctuations, and is puzzling to engineers upon first acquaintance with quality control technique.

Measurement *v.* Gauging

Mr. W. J. Jennett, who followed the writer, developed this question further and explained by means of diagrams the use of elementary statistical theory in setting control limits so as to allow for any predetermined amount of systematic variation, such as errors in measurement, " batch error," etc., in addition to the random variation inherent in the production process.

The informal discussion which followed showed the keen interest that engineers concerned with wartime production are taking in these newer quality control developments, which have arisen as solutions of actual factory problems occurring during the last few months and which are consequently not dealt with in the existing standard guides to the subject. Among those who took part in the discussion were Mr. A. W. Swan (Ministry of Supply), Mr. H. H. Harrison (Ministry of Labour Staff College), Mr. Lockett (Bristol Aeroplane Co.) Mr. Cooper (Belling & Lee, Ltd.) and Mr. M. G. Kendall (U.K. Chamber of Shipping).

The discussion also revealed the need for a consideration of another problem which occurs repeatedly when applying quality control to engineering production, namely, what system to adopt when it is either impossible or uneconomic to measure the product for control-chart purposes. The use of go and not-go gauges is widespread in engineering work and there are several ways of employing quality control under such circumstances. Some of these methods, based on " fraction defective " or " number defective," have been newly developed in this country as a direct result of the wartime applications of quality control.

The Industrial Applications Group of the Royal Statistical Society has expressed its intention to devote the next informal meeting to a practical consideration of this all-important question. The attendance and the keenness of the discussion at the opening meeting augur well for a growing support of this latest endeavour, which aims at bringing together the statistical and engineering sciences in a way that should prove to be of lasting benefit to both.

Coopers Hill War Memorial Prize

THE above prize, which was founded by members of the Royal Indian Engineering College, Coopers Hill, in commemoration of members of the College who fell during the last war, is awarded annually by the Institution of Civil Engineers and triennially in turn by the Institution of Electrical Engineers, the School of Military Engineering, Chatham, and the School of Forestry, Oxford. The prize, which consists of a bronze medal, a parchment certificate of award and a money prize of about £20, is awarded for the best paper on a professional subject selected by the Council making the award. The triennial award falls this year to the Council of the Institution of Electrical Engineers who have decided to invite members to submit for consideration a paper on any subject coming within the scope of electrical science or electrical engineering and their applications. Papers submitted must be specially written for the purpose of the competition and must reach the secretary of the Institution not later than September 1st, 1943. Only corporate members of the Institution who were under 35 on January 1st are eligible. All papers submitted for the competition will also be considered with a view to publication in the *I.E.E. Journal* and would then become eligible for consideration in connection with the ordinary premiums awarded by the Council at the end of each session.

I.M.E.A. Notes

Post-War Reconstruction

IT is reported in the February *Journal* of the Incorporated Municipal Electrical Association that it was decided at a recent meeting of the Joint Committee of Electricity Supply Associations that another Committee representative of the constituent associations should be set up to deal with reconstruction problems, on account of the magnitude, importance and special character of these problems.

There will be thirteen members of this Special Committee representing the whole of the electricity supply industry. The I.M.E.A. representatives will be Messrs. A. J. C. DeRenzi, F. Forrest, W. P. Lilwall and F. Newey and Aldermen Capt. C. Saer and W. Walker.

Distribution Costs Comparison

The Central England Centre of the Incorporated Municipal Electrical Association has suggested that a standard formula should be devised for determining distribution costs to enable accurate comparisons to be drawn. The Council has adopted the suggestion and has asked the Centre, in collaboration with other Centres, to prepare and submit to the Council a proposed standard return or tabular statement, with explanatory notes and formula.

Meter Standardisation

At a recent meeting of the I.M.E.A.-B.E.A.M.A. Joint Committee consideration was given to the question of the standardisation of electricity meters. It was felt that a discussion of the general subject was necessary and desirable and the meter manufacturers were said to be anxious to assist. Consequently a joint committee representative of B.E.A.M.A., the I.M.E.A. and the power companies' association is being established for this purpose.

The Morning Peak

Switching Industrial Demand

EXAMPLES of the way in which industrial users are co-operating in reducing the peak load on electricity undertakings, which usually occurs between 8 a.m. and 1 p.m., are given in the March issue of the *Production and Engineering Bulletin* issued by the Ministry of Labour and National Service and the Ministry of Production.

Reports show clearly that very useful net reductions in the use of electricity have already been made and that the peak load problem has been eased to some extent, but further levelling is necessary. Figures for a number of firms show that their demands, while increasing slightly during the morning, are comparatively steady throughout the day. The domestic load is responsible to a large degree for the morning peak, but while assistance in this direction is essential domestic consumers have not the same opportunity as industrial users of switching their demands from the morning to the afternoon.

To illustrate the effect of load transference it is recorded that a firm, when approached, agreed to arrange that whenever possible a 1,800-kW furnace should be started up during the afternoon instead of the morning. As the peak load on the plant of the Corporation Electricity Department was about 37,000 kW, this one transfer meant a reduction of about 5 per cent.

Several cases are mentioned in which transfers of load have been made without much difficulty. Electric motor manufacturers, for instance, have been able to avoid putting the machines on test during the morning, and it is considered that this idea might well be adopted more widely in connection with any testing which involves the use of electric power. Other firms with power-operated plant and machinery of high ratings which is used spasmodically now arrange that the plant shall not be operated in the mornings. Two cases in point are a 480-kW upsetting machine in a Cornish factory and a 400-kW rolling plant in another West Country factory. Many concerns running heat-treatment plants have undertaken whenever practicable to start up their furnaces at times outside the peak period. In one instance this is done by operating the furnaces on a two-shift basis. In other cases cold storage compressors have been entirely cut out, or the load reduced, during the hours when the demand for power is at its maximum.

The *Bulletin* points out that lighting and heating are important factors. In factories permanently blacked out more extensive use might be made of daylight panels, and in others more care might be taken to make sure that the black-out is withdrawn as early as possible in the morning. Notwithstanding the approaching seasonal reduction in total demand the peak load problem still remains, and firms and individuals are asked to continue to make every effort to economise, particularly in the morning.

Workmen's Compensation

Government and Beveridge Proposals

AN important section of the Beveridge Report, so far as industry is concerned, is that dealing with Workmen's Compensation (see *Electrical Review*, December 11th, 1942, p. 763). During last week's debate on the Report in the House of Commons Sir John Anderson (Lord President of the Council) said that the Government recognised that there were definite advantages in Sir William Beveridge's plan such as simplicity and the possibility of reducing friction between employers and workers, but there were also certain marked disadvantages.

The inclusion of industrial accident risk in the general risk covered by the "all-in" contribution might possibly weaken the incentive to safety inherent in the existing system. The proposals might also be thought to go too far in the direction of relieving employers of all responsibility for finding employment for workpeople who were permanently, but not totally disabled.

Through the scheme the workers would also be contributing to accident compensation which was a very novel feature. The suggestion that a special levy should be made on particularly hazardous industries was another disadvantageous feature. Finally, it seemed to the Government difficult to justify a higher benefit after the first thirteen weeks envisaged by the report as this would fall on the general contribution.

The Government therefore took the view that this part of the Beveridge plan called for further consideration in the light of the debate.

Plastics and the Public

Federation's Campaign to Dispel Mistaken Ideas

THERE was an attendance of over three hundred members and guests at a luncheon held at Grosvenor House following the annual general meeting of the British Plastics Federation, Ltd., the present membership of which totals 198 separate companies, including 51 applicants accepted during the past year.

Major Stanley M. Mohr (Micanite & Insulators Co., Ltd.) presided and referred to the confused ideas of most members of the general public about the nature and purpose of plastic substances, which, if not corrected, might do the industry more harm than good. The attractiveness to investors of shares bearing the mysterious title "plastics" was not altogether desirable. Super-optimistic impressions needed to be corrected, otherwise the fair name of a young and virile industry might be brought into disrepute.

Accordingly the B.P.F. Council had under consideration a propaganda campaign with the long-term objective of promoting public recognition of plastic substances as a high-quality class of reliable materials of greatly differing characteristics. At the same time it was necessary to dispel beliefs that plastics were extremely cheap (and therefore nasty) or mysterious, and to explain the limitations and applications of various types. The chairman said he was confident that members of the Federation would in due course be prepared to provide funds by voluntary subscriptions for a publicity campaign of a sufficiently comprehensive nature to be launched on behalf of the industry as a whole.

Not Merely Substitutes

At the beginning of the war plastic substances were regarded with suspicion as substitute materials for certain classes of light alloys and non-ferrous metals generally, but in many instances the fact had since been proved that the performance of parts and components, large and small, stressed and unstressed, all made of plastic materials in one form or another, had been such as to reverse the situation by cancelling out the word "substitution." Indeed, the dimensions and natures of some of the items mentioned would surprise the uninitiated, but the chairman warned his audience not to lose sight of the fact that after the war intensive competition must be anticipated, so it behoved them to put their own house in order now.

With that object in view the Council of the Federation, with a full sense of its responsibilities, was making a serious endeavour to broaden its scope and strengthen its spheres of influence, to accomplish which ends ways and means of increasing its revenue were at present under consideration. The organisation had been in existence for only ten years and could not afford to remain static.

The chairman again commended the sane and far-sighted implications of the apprenticeship scheme successfully launched by the Institute of the Plastics Industry, which now had a membership of over 400. The Federation and Institute were complementary to one another and their relationship was most cordial.

The chairman concluded by thanking all Government officials present at the function for their co-operation and the help they had rendered the industry in difficult circumstances.

Mr. Laurence Merriam, Plastics Controller, responding on behalf of the guests, recalled that control commenced in August, 1940, being then applied to one section only, whereas now all sections of the industry were so controlled that plastics could be made only for Government purposes. Some fifty materials were now subject to control and more recently "trading control" had been exercised in respect of Lease-Lend imports to the value of several million pounds per year. All of this had been done with a control staff of 28.

Electrical Travellers

Men with a Mission

THE annual luncheon of the Electrical Trades Commercial Travellers' Association is one of the few electrical functions which have continued in spite of the war, and its popularity was shown on Friday last when a large gathering of nearly 400 members and friends met once again at the Connaught Rooms, London, W.C.2.

The principal guest was Mr. J. S. Highfield, who, in proposing the toast of "The Association," spoke of some of the problems which would confront this country and industry after the war. He said that in promoting trade there was no greater way of cementing friendship than by honest dealing, and the traveller would have great opportunities in furthering this end. A knowledge of languages would be of value as we should have to send people from this country to speak to the people in other countries in their own tongue.

Dr. A. H. Railing, the president of the Association, responding to the toast, paid tribute to Mr. Highfield, who, he said, was a great pioneer both in the supply and the manufacturing industries. He had done a great deal to help those in need, an instance being his work for the E.I.B.A. The speaker said that the electrical traveller was a missionary and his mission was to show how electricity could be used to relieve human tasks. He must know what his mission was and how to bring home to his clientele the benefits he had to confer.

Mr. A. E. Iliffe proposed the toast of "The Guests," and Mr. L. C. Penwill, in responding, referred to the work of the Electrical Fair Trading Council in promoting co-operation in the industry. He thought that the commercial traveller should not only be a missionary to the user, but should also be able to suggest improvements in apparatus as a result of his experiences.

Mr. S. Johnson, charity steward, made an appeal for the charities of the Association, as a result of which over £60 was collected, and the function was brought to a close by a toast to the chairman, proposed by Mr. F. W. Wheatley, and responded to by Mr. D. J. Hughan.

INSTITUTION PROCEEDINGS

Busbar Protection

A CRITICAL review of practice revealing the inadequacy of prevailing means of protecting busbars, which are merely incidental features of the protection afforded to elements of a distribution system other than the busbars themselves, is presented in a paper prepared by Messrs. M. Kaufmann and W. Szwander (Metropolitan-Vickers Electrical Co., Ltd.) for a joint meeting in London of the Measurements and Transmission Sections of the INSTITUTION OF ELECTRICAL ENGINEERS.

Desirable attributes of specialised schemes developed for application to busbars themselves are discussed and some of the principles employed are described and illustrated by typical examples. Guidance is given in the choice of a suitable scheme for a variety of cases together with some recommendations concerning supplementary measures intended to limit and localise damage consequent on busbar faults and to facilitate repairs.

Reliability of Available Systems

The general conclusions are that busbar protective schemes are available that attain to the high standard of performance nowadays expected of distribution systems, and that they can be relied upon not to impair the reliability of any system to which they are applied. The stringent precautions taken to ensure the greatest possible reliability are not an indication that the schemes are not sufficiently reliable in themselves, but are the result of the need for an exceptionally high degree of reliability compared with that of the protection for other elements.

Since the selectivity of busbar protection together with its high speed of operation, constitutes its main advantage, it is especially applicable to installations with sectionalised busbars.

The application of separate busbar protection lends itself more easily to newly projected plant than to existing installations. For this reason it is important to give consideration to the possible future application of an appropriate busbar protective scheme in designing new plant, if its importance is likely to warrant it, even if an immediate application is not intended. The provision for its future addition should include, for example, insulating the switchgear framework from earth, providing current transformers (or accommodation therefor) on both sides of busbar-coupler and busbar-section breakers, etc.

Busbar protective schemes must be adapted to the individual needs of the particular case. Unnecessary complication or elaboration should be avoided. For the less important installations only relatively simple schemes can be justified economically ; but, in general, schemes without some form of "check" should not be used. Testing facilities should preferably be provided if the scheme is at all elaborate.

Though improvements in the existing system back-up protection are not a substitute for proper busbar protection, they should be considered in cases where the application of busbar protection is so difficult as to be impracticable.

N.W. Centre Wireless Group

WITH the approval of the I.E.E. Council a Wireless Group of the North-W stern Centre of the Institution is being formed. Four meetings have been arranged for the current session, the inaugural one on March 12th being informal and including a discussion on "Quartz Crystal Applications" to be opened by Capt. C. F. Booth. The meetings will be held at the Engineers' Club, Albert Square, Manchester, and start at 6 p.m. They are open to all members of the Institution, but members of the Centre who are actively engaged within the scope of the I.E.E. Wireless Section are recommended to apply for membership of that Section, which automatically gives them membership of the North-Western Wireless Group. In this way it will be possible to envisage the needs of the Group when preparing next session's programme. There is no extra subscription.

The provisional committee of the new Group comprises Professor Willis Jackson (chairman), Mr. S. E. Goodall, Mr. G. J. S. Little, Dr. J. L. Miller, Dr. E. B. Moullin, Mr. G. R. Polgreen and Dr. N. H. Searby, together with the Centre chairman (Mr. L. H. A. Carr) and hon. secretary (Mr. T. T. Evans).

The Institution Library

IN future on those nights when Institution meetings are taking place the library of the Institution will remain open for the convenience of members until the end of the meeting, usually about 7.30 p.m., except in the case of the meetings of the London Students' Section, when the library will be open until the commencement of the meetings at 7 p.m.

A.S.E.E. Arrangements

THE annual luncheon and re-union of the Association of Supervising Electrical Engineers is to be held at the Connaught Rooms, London, W.C.2, on Saturday, March 13th. The president Mr. H. W. Swann, M.I.E.E., will preside and the price of the tickets will be 9s. 6d.

It has been decided to hold the Association's annual general meeting on Saturday, May 22nd, at Aldwych House, London, W.C.2.

PERSONAL and SOCIAL

News of Men and Women of the Industry

WITH the departure of Mr. W. N. C. Clinch from the municipal side of the electricity supply industry on his appointment as deputy general manager of the Northmet Power Co., the office of vice-president of the Incorporated Municipal Electrical Association became vacant. It is now announced that **Mr. W. P. Lilwall,** electrical engineer and manager at Fleetwood, has been elected to the office. Mr. Lilwall, who is an associate member of the I.E.E., was trained at Manchester Technical School, with the Westinghouse Co., at Trafford Park and as a pupil at the Longford generating station of the Stretford U.D.C. After serving for a period as shift engineer with the Warwick & Leamington Traction & Power Co. he was appointed engineer-in-charge at the Bonnybridge power station of the Scottish Central Power Co. From 1911 until he took up his present position in 1919 he served as chief assistant to Mr. W. A. Walker at Kettering. In addition to his duties as electrical engineer at Fleetwood he has acted as consultant to the Thornton Cleveleys U.D.C., the Fylde Water Board and other public authorities.

Mr. W. P. Lilwall

Mr. W. J. Bache, who recently retired from the position of borough electrical engineer of Cheltenham, and **Mr. F. H. Whysall,** former city electrical engineer of Belfast, have been elected associated members of the I.M.E.A. Mr. Bache was president of the Association in 1937-38.

Mr. M. H. Goldstone, chairman and managing director of Ward & Goldstone, Ltd., has given £1,000 to the R.A.F. Benevolent Fund, stipulating that the money is to be used to buy a business or partnership for a disabled member of the R.A.F. and that the gift must not affect the payment of pension or other emoluments to which the airman would normally be entitled.

Mr. A. Anderson recently relinquished his position as managing director of the Eastern Group of Edmundsons associated undertakings which at present provides supplies to over 110,000 consumers covering an area of approximately 4,000 square miles of territory. This occasion provided an opportunity for the managers and staff of the Eastern Group of companies to present him with an inscribed silver salver, a mahogany bookcase, and a cheque, as a token of their appreciation and high esteem for his past services. In addition, the London staff of Edmundsons Electricity Corporation, Ltd., presented him with a silver cigar and cigarette box. There were also two autograph albums containing the signatures of the large number of subscribers towards the gifts. Mr. Anderson has been associated with Edmundsons Electricity Corporation for over forty-two years and although he is relinquishing the position of managing director of the Eastern Group he is not completely severing his connection with the parent company, as he will continue to be a director of three companies in the Group.

Mr. W. Good, B.A., A.C.A., managing director of Brush Coachwork, Ltd., has been appointed to the board of the Brush Electrical Engineering Co., Ltd., of which Brush Coachwork, Ltd., is a subsidiary. Before becoming managing director of Brush Coachwork, Ltd., in January, 1942, Mr. William Good was general manager of the Projectile Division, Wyndham Hewitt, Ltd. He is also a director of Essex Aero, Ltd.

Professor F. C. Lea, O.B.E., D.Sc., has been elected president of the Institution of Mechanical Engineers. Dr. Lea was Professor of Engineering at the University of Sheffield from 1924 to 1936, and on his retirement was appointed Emeritus Professor. He is a director of Edgar Allen & Co.

Mr. Thomas Dyke and **Mr. N. A. Enticknap,** who, as was reported last week, have been appointed temporary joint secretaries of the General Electric Co., Ltd., have both many years' service with the company ; the former joined in 1904 and the latter in 1910. They have been connected throughout with the accountancy side of the business. Mr. Dyke started in the invoice department and served variously in the bought ledger and cashier's departments until he was made assistant secretary in 1925. He has always been an enthusiastic and indefatigable

Mr. T. Dyke

Mr. N. A. Enticknap

worker for G.E.C. social and sporting affairs and has been secretary of the Social and Athletic Club for a number of years. He is also chairman of the "G.E.C. Well-Wishers Club," an institution, which he started in the last war and revived in the present one, for sending parcels to employees in the Services.

Mr. Enticknap joined the company as a member of the audit and accounts department and has acted in various capacities on the financial and accountancy side ever since. The company's wide interests abroad have made it

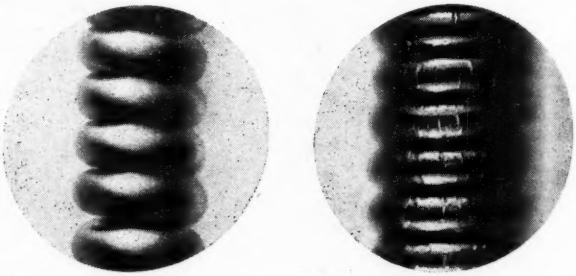
(*Continued at foot of next page*)

Enamelled Wire

Toughness of "Thermex"

AN outstanding requisite of an enamel covering for conductors is that it shall have sufficient toughness and flexibility to withstand the severe treatment received in winding processes and in service conditions. It is claimed for "Thermex" enamel, which is produced as B.S. Standard Class "A" insulation in this country by the British Thomson - Houston Co., Ltd., and is in use in the United States under the name of "Formex," that while retaining the salient advantages of conventional enamel its resistance to abrasion and tenacity of adhesion to copper wire are such that a cotton covering or other protection from damage is unnecessary. This results in the saving of space where it is most valuable and better ageing characteristics. "Thermex" enamel is composed of polyvinyl acetal resin, which possesses exceptional toughness, in combination with a thermo-setting phenolic resin, and is made entirely from synthetic sources.

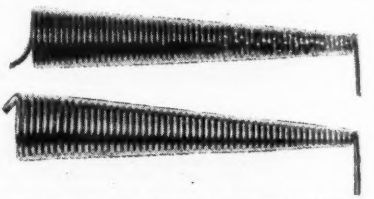
In the following test the enamelled wire had an overall diameter of 0·0385 in., the diameter of the bare wire being 0·036 in. and the radial thickness of the insulation 1·25 mil. The electric strength in air with rapidly applied voltage was 4,500 V at 60 deg. C. and 4,700 at 180 deg. C. After seven days in tropical atmosphere the corresponding value was 4,100 at 20 deg. C. The insulation resistance at 150 deg. C. was over 500 MΩ A higher breakdown strength at 180 deg. C. than at 20 deg. C. is probably peculiar to this enamel, which is said to show no signs of deformation after running at from 170 to 185 deg. or of thermoplastic flow within the temperature range found in service.



Comparison of "Thermex" enamelled wire (left) and conventional enamelled wire after stretching and winding on mandrels

The electrical characteristics of the film are substantially unaffected by exposure to moisture or by prolonged immersion in most of the common solvents, dilute acids and caustic solutions, thus permitting the use of certain types of thermo-setting varnishes with superior electrical and bonding qualities but hitherto destructive of enamel.

The enamel is essentially organic in nature and conductors treated with it comply with B.S.S. 156 for enamelled high-conductivity annealed copper wire. Its use is being extended by the B.T.H. Co. with a view to superseding other types of its Class A wire coverings.



"Thermex" wire (bottom) compared with conventional enamelled wire after 150 deg. C. heat shock

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Personal and Social (*Continued from page* 289)

necessary for him to travel quite extensively. In 1937 he became chief accountant in succession to Mr. E. W. J. West and, at the same time, was appointed assistant secretary. He is also secretary to the majority of the subsidiary and associated companies of the G.E.C.

Ashton-under-Lyne Town Council has voted £50 to **Mr. A. H. Carroll,** station superintendent, in recognition of the considerable amount of additional work carried out by him during the past few years over and above the normal duties of station superintendent.

Mr. H. Bewes, whose appointment to Luton was reported in our last issue, is to be chief clerk of the mains and distribution section, not of the Electricity Department as a whole.

Wills.—Mr. H. Broadbent, late chairman and managing director of Thomas Broadbent & Sons, Ltd., Huddersfield, left £122,963, with net personalty £112,621.

Mr. S. E. Fedden, former manager, Mid-East England District, Central Electricity Board, and for about thirty years city electrical engineer and manager at Sheffield, left estate valued at £43,675 (£42,922 net personalty).

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Electrification of Farms

ONE of the aspects of rural electrification referred to in Mr. A. Cameron Brown's article in the *Electrical Review* of January 22nd, is of more than passing importance to both electricity supply and agricultural (farming) industries, namely, the lack of authentic and accurate data of the number of farm premises connected to public supply and the extent of the use of electricity on them.

At present there is no comprehensive expression to denote what is included in the term "farm consumers." Until this is more clearly defined the percentage of farms connected to electricity undertakings, *i.e.*, houses, buildings and land in occupation for cultivation under one management, will not be forthcoming.

The only information I know which can be used as a basis is the table of agricultural holdings in the Agricultural Statistics of the Ministry of Agriculture and Fisheries. The table relates to areas of land only above one acre in extent in groups for every county of England and Wales.

For the purpose of these statistics an "agricultural holding" is any area of agricultural land exceeding one acre in extent that is farmed as a separate unit by the occupier whether as owner or tenant. For this purpose "agricultural land" is defined in the Agricultural Returns Act, 1925, as including "land used for grazing, meadow or pasture land or orchard or any land used wholly or mainly for the purpose of the trade or business of a market gardener or nurseryman."

Mr. Cameron Brown rightly points out that the table of agricultural holdings contains areas of land used for a variety of purposes with no houses or buildings attached and not used for what is generally accepted as farming and also that there are farms obtaining electricity from other sources than public undertakings.

The Chester area of supply contains ninety-nine parishes. In 1933, for a charge of £3 15s., a list was obtained of the agricultural holdings in the groups of Table 8 of the Agricultural Statistics and the addresses of each holding from the local crops reporters.

A careful examination has been made of the 1,648 agricultural holdings in the Chester area and it is concluded that the holdings in the group of from one to five acres should not be regarded as farms and that the remaining groups, for the purpose of records and statistics, should be accepted as coming within the title "farm." By this deduction there are in the Chester area of supply 1,224 agricultural holdings which may be regarded as farms.

If electricity supply authorities would make use of the Ministry's Agricultural Statistics, in this way, and compile similar data to that given in brief in the accompanying table, more comparable information would be available of the development and use of electricity for agricultural purposes.

AGRICULTURAL HOLDINGS IN CHESTER SUPPLY AREA

Groups. Acres.	*No. of Holdings*	*Acres*	*Average Acreage*	*No. of Consumers*	*No. of Cons. as % of Holdings*	*Acres*	*Average Acreage of Electl. Holdings*	*kWh Sold*	*Average kWh Sold*	*Income* £	*Average Income* £
1 to 5 ..	424	1,306	3	185	43·6	569	3	596,542	3,227	3,395	18·3
5 to 20 ..	464	5,140	11	235	50·6	2,642	11	1,151,412	4,900	6,372	27·1
20 to 50..	253	9,446	37	136	53·7	4,609	33	473,160	3,480	2,721	20·0
50 to 100	204	14,886	73	136	66·7	10,165	75	379,986	2,794	1,947	14·3
100 to 150	136	16,984	125	88	64·7	11,144	127	329,615	3,746	1,815	20·6
150 to 300	154	32,069	208	117	75·9	24,268	207	732,085	6,258	3,712	31·7
Over 300	13	4,930	379	10	76·9	3,677	368	77,628	7,762	379	37·9
	1,648	84,761	51	907	55·0	57,074	63	3,740,428	4,124	£20,341	£22·43
AGRICULTURAL HOLDINGS WHICH MAY BE REGARDED AS FARMS											
	1,224	83,455	68	722	59·0	56,505	78	3,143,886	4,354	£16,946	£23·47

Chester.

S. E. BRITTON,
Engineer and Manager.

An I.E.E. Generation Section

I FULLY agree with Mr. Carr's views expressed in your issue of February 12th, that the establishment of a Generation Section of the I.E.E. would be of great benefit not only because of the savings which could arise out of papers and discussions, both in selected power stations and in industrial power stations. The problems connected with generation, whether by steam, water or

internal combustion engine cover the electrical, mechanical and civil engineering divisions into which our profession is divided.

To reach its highest value, the proposed Generation Section should be linked up with other bodies such as the major institutions and the Institute of Fuel. These discuss papers, access to which is barred to members of the I.E.E. unless they are also members of the other body, yet the I.E.E. generation members could out of their specialised knowledge contribute valuable information.

In countries abroad the divisions of the engineering institutions are not so many, they cover a wider ground. While it may be difficult to fuse our institutions into one body, it should be comparatively easy to make such a section as the Generation Section act as a link between the institutions. As a power station engineer writing on behalf of myself and my colleagues I would welcome the foundation of such a section to link together the present varied activities connected with generation.

York. A. GEORGE FORGAN.

MR. CARR'S suggestion seems to me to be of doubtful force. He applies logic, he wants a repeating pattern, where a survey of the needs would be sounder. Generation may be the root of the electrical tree, but what evidence is there that we want to dig up the roots and plant them in the soil of more committees? Train the branches where you will, you can still sit around the trunk and discuss the roots, soil chemistry, and anything relevant.

I feel that to leave generation as a subject for main Institution meetings leaves it in its proper position. It is a complex of interlocked specialities each of which is treated in special places. About 90 per cent. of our operation expense is on fuel and mechanical plant maintenance and 90 per cent. of our investment is in buildings and mechanical plant. The planning of generating plants follows principles, many of which arise from legal, commercial and human considerations that all can appreciate. They are not abstruse. An Institution meeting on a generation subject becomes a Generation Section meeting without formal declaration and registration. Non-generation men who attend can often contribute usefully to discussion and they are welcome.

The attraction of Institution meetings is often in meeting men whose work falls round the boundary of the main subject. The tedium when a meeting is tedious is experienced by one specialist listening to another similar specialist whose interest in elocution is small, reading just audibly, but without enthusiasm, something that No. 1 specialist has already read. The cure for this is to make the gatherings less formal and let a reporter collate what is said. Something of this kind is being done by the Institution of Mechanical Engineers.

Mr. Carr says that Mr. Favell's most useful paper on siting would have been overlooked but for the Press. Does he not read his transactions? Did they not reach nine out of every ten men interested in siting?

Mr. Carr suggests that there is nowhere to discuss generation problems and that they may be getting overlooked. It seems to me that idea is due solely to present difficulties of pressure on time and of travel. The Institution can provide the forum and assemble the agenda whenever there is the demand. Do we need to split into permanent sections for that?

It would be prudent before long to attend to the rationalisation of Institutional activities whereby a consortium of engineering bodies turns to the best advantage all the organisation, time and money spent on institutions, by the foundation of a supreme engineering house of many mansions, having a family council, with many more joint meetings. Then a combined generating section would call forth the interest of all institutions concerned. No institution need shed its identity when it fits into such a plan.

Hull. W. H. DUNKLEY, B.Sc., M.I.E.E., A.M.I.Mech.E., *Generation Engineer.*

Mass Radiography

RECENT statements, official and otherwise, that only time can show whether the results expected of mass radiography will be achieved, require some explanation. It seems to be one of the surest ways of diagnosing the onset of tuberculosis early enough for the spread of the disease to be effectively checked, and can hardly be regarded as experimental when for eight years all the factory workers in this country of Philips Lamps, Ltd., have undergone routine X-ray examination. Experience thus accumulated is not only indicative of the reliability of the method, but also shows it to be an economical means of reducing the disease among industrial workers. Reporting in *The Lancet* on the results achieved (4,870 men and 6,940 women were X-rayed during the 1936–40 period) the company's medical officer, Dr. L. Banszky, states that early diagnosis has enabled 34 per cent. of treated cases to return to useful occupations, while only about 25 per cent. of treated cases have suffered relapse after returning to work. Of employees originally diagnosed as doubtful (permitted to work under observation in properly chosen surroundings) change for the worse has occurred in only 5·6 per cent. of cases over a period of five years; there has been definite improvement in lung condition in some 10 per cent. of cases during the same period.

Confirmatory detailed information in respect of the systematic examination by X-rays of native labourers in gold mines has been published in the *Transactions* of the South African Institute of Electrical Engineers.

COMMERCE and INDUSTRY

Paper Salvage Reminder.

Waste Paper and the E.I.B.A.

WE have received from Mr. V. W. Dale, chairman of the Electrical Industry Waste Paper Recovery Committee, a further list of electrical companies, firms and individuals who have arranged to hand over to the Electrical Industries Benevolent Association all proceeds from the disposal of their waste paper. This is an excellent way of helping two worthy causes at once.

The list gives an opportunity of stressing once more the continuing necessity for saving every scrap of paper for the production of munitions. If any difficulty is experienced in securing the regular collection of waste paper a postcard to the above-mentioned Committee at 2, Savoy Hill, London, W.C.2, will lead to improvement.

It should again be stressed that the only effective way of ensuring the maximum salvage of waste paper (and other materials) is the appointment of a salvage officer of adequate standing having the backing of the management. Such a man should be given access to all old files, ledgers and other commercial books and documents and should possess sufficient knowledge to be able to discriminate between matter of ephemeral and permanent value.

Hammersmith Demonstration Centre

On Thursday last week the Mayor of Hammersmith (Alderman E. E. Woods) officially opened premises at 144, King Street, which the Borough Council Electricity Department has taken over from the Ministry of Food for use as a demonstration centre. As explained by Councillor R. H. Kent, chairman of the Electricity Committee, the immediate purpose of the centre will be to give demonstrations and advice on all matters relating to the best and most economical use of fuel and food. Taking the long view, the premises will also serve as a "token" showroom for the south part of the borough, the electrical development of which suffered before the war from lack of display and demonstration facilities. As evidence of this, Councillor Kent mentioned that of the 4,000 cookers installed in 1939 only 1,400 were in South Hammersmith. It was hoped that the Electricity Department would be able to resume its normal functions quickly after the war, and as soon as possible a proper showroom and demonstration centre would be established close to the Town Hall. The Department made a speciality of service and for a long time had supplied electricity at the cheapest rate in any London borough.

The new demonstration centre opened by the Hammersmith Electricity Department

British Concerns in Portugal.

Contract Price Adjustment Formulæ

The British Electrical and Allied Manufacturers' Association notifies us of the latest figures for use in its contract price adjustment formulæ. They are as follows :—

(a) "Rates of Pay"—the rate of pay for adult male labour at February 13th shall be deemed to be 80s. 6d. ; (b) "Costs of Material" —the index figure for intermediate products last published by the Board of Trade on February 13th is 171·2 and is the figure for the month of January, 1943.

These are the same as for the preceding period.

Industry and the Public Schools

In its evidence submitted to Lord Fleming's Committee on the Public Schools, the Federation of British Industries has expressed the view that the public schools should be continued in some form, believing that the type of education they provide can make a substantial contribution to British industry. It is stated to be the experience of many firms that the public school boy has generally proved suitable for administrative work in industry, although others, not from public schools, have many successes to record.

From the evidence submitted it appears that relatively few boys from public schools offer themselves for training in the technical and works side of industry, though their qualities would equip them well for such posts. This reluctance may be due to the fact that some firms treat entrants at the age of 18 or 19 from a public school on the same basis as they treat

other boys at 15 or 16. Other restraining influences may lie in such things as school traditions. To counteract this latter deterrent, it is suggested that careers masters should have a broad knowledge of the opportunities provided by industry and commerce, representatives of which might well be included on the governing boards of public schools. The Federation is anxious to encourage a closer contact between industry and the public schools, and is inquiring how the entry of public school boys into industry can be facilitated.

Wages in the Cable-Making Industry

In the *Electrical Review* of February 5th (page 185) it was reported that a new scale of wages had been adopted by the Joint Industrial Council for the Electrical Cable-Making Industry and that the cost-of-living sliding scale had been suspended.

The Council has now agreed increases for time-workers and piece-workers under adult age. These advances, which are payable as from the first pay-day in February for the period covered by that day, range from 1s. to 3s. per week of 47 hours, according to age, for female time-workers. For male time-workers the increase is 3s. per week from 14 to 16 inclusive, and 4s. from 17 to 20. The advances for female piece-workers range from 8d. to 2s. and those for male workers are 2s. 4d. from 14 to 16 and 3s. 2d. from 17 to 20.

A tabulated statement of the new rates for all workers has been issued by the Council.

Engineers' Wage Claim

On Thursday last week the joint committee of representatives of the Engineering and Allied Employers' National Federation and of the engineering trade unions gave detailed consideration to the employers' counter-proposal made in reply to the unions' request for increased wages. The results were reported to the full negotiating bodies on the following day.

At the conclusion of the meeting it was announced that no decision had been arrived at. The employers' offer was considered unacceptable and the trade unions put forward a counter-proposal which the employers could not accept. The conference was therefore adjourned to enable the trade union representatives to consult their executive bodies; it was expected that the parties would meet again this week.

Public Utility Companies in Portugal

A Bill before the Portuguese Legislature affects the position of British-owned public utility companies in Portugal. One provision is that the head offices of foreign-owned companies must be transferred to Portugal. Among the companies affected are the Anglo-Portuguese Telephone Co. and the Lisbon Electric Tramways, both of which are British-owned.

The *Financial News* says it is stated that the rights of foreign nationals will be respected " as far as possible," but in future when shares are transferred preference must be given to foreign buyers. Shareholders may only participate in company meetings when their bonds have been deposited eight days previously with the Portuguese offices of the company or with a Portuguese bank.

Another provision is that in future only Portuguese companies will be able to acquire or install public utility enterprises, which must have at least 65 per cent. of Portuguese capital and a Portuguese president and managers. Portuguese shareholders may not dispose of their holdings in utility companies to foreigners.

Iron and Steel Distribution

The Ministry of Supply announces that the following provisions will apply for the future to the Iron and Steel Distribution Scheme:—

No orders for the following materials may be accepted by makers during the last month of any period for delivery in that period without prior approval of the Iron and Steel Control, which will be given only in exceptional circumstances and normally only after consultation with the Government Department concerned:—Heavy rolled steel, shell steel, re-rolled steel, bright steel bars, cold-rolled strip, sheets, tubes, forgings, drop forgings, steel castings, iron castings and alloy steel. An exception may be made for orders under one ton where the material is required for urgent repair work.

Any permission previously given for orders to be carried forward by more than one period beyond that for which they were authorised is withdrawn (except in the case of bolts, nuts, rivets, washers and screws) and they can only be executed if the authorisation is specifically extended by the Government Department concerned.

Steel producers have been asked to notify customers in good time of the state of uncompleted orders to enable these customers to apply for an extension of authorisation.

Training Shipyard Welders

A syllabus for the training of arc welders for employment in shipbuilding has been prepared by the Institute of Welding with the approval of the Welding Research Council. It is arranged to permit separate training for plate thicknesses of from $\frac{1}{4}$ in. to $\frac{1}{8}$ in. and of $\frac{1}{8}$ in. upward, it being suggested that after basic training (downhand) is received by single-purpose welders they should undergo a period of actual yard work, satisfaction in which would entitle the trainees to additional training in horizontal, vertical and overhead work. The syllabus includes notes on the arrangement of lessons, made up in each case of lecture, demonstration and practice periods, their numbers and total instructional times in hours being stated for each type of welding.

Code for Valve Users

With a view to giving guidance to designers of radio equipment on how to obtain the optimum life and performance from valves, some instructions have been drawn up by the British Radio Valve Manufacturers' Association and are issued by the British Standards Institution (after consultation with its interested Committees) as a War Emergency B.S. Code of Practice relating to the use of radio valves in equipment.

The importance of consulting the valve specifications before undertaking the design of equipment is emphasised, and collaboration with the valve manufacturers is advised in cases where exceptional needs arise, or where

the valve is to be put to a use which does not appear to be covered by the valve specification. Sections of the code then deal with valve dimensions, ratings, heater voltage regulation, mounting, ventilation, heater/cathode insulation, DC connections between electrodes and the cathode and grid voltages.

This Code of Practice is published as B.S. 1106/1943, and copies may be obtained from the B.S.I. 28, Victoria Street, London, S.W.1, price 1s. post free.

Electrically-Propelled Ships

It is reported in *Lloyd's List* that according to an announcement by the Westinghouse Electric & Manufacturing Co., Pittsburgh, some 900 United States Navy, auxiliary and merchant ships built or under construction in 1942 will be electrically driven. The Westinghouse Co. is supplying the electrical equipment for more than one-third of these ships. The largest of the new electrically-driven ships is a troop transport requiring 20,000 HP to drive her propellers. The machinery of all the electrically-driven ships totals more than 6,000,000 HP.

Wartime Building Supplies

The publication prepared by the Ministry of Works bearing this title has reached a third edition. It sets out, with drawings, a schedule of requirements for Government Departments in plumbers' brassfoundry, builders' ironmongery, etc. The electrical interest resides in an appendix containing recommendations with regard to electrical installations designed to achieve economy in materials of which there is a shortage, *e.g.*, the use of plastic materials for switchplates, lighting fittings, etc., wood instead of heavy iron distribution boards, and v.i.r. cable on porcelain cleats instead of conduit.

The booklet is published at 1s. net by the Stationery Office.

Ministry of Works

Under a provision of the Town and Country Planning Act, 1943, the Ministry of Works and Planning became the Ministry of Works on February 10th.

High-Speed Machines

A course of three lectures on "Practical Experiences with High-speed Electrical Machines" is being given at the Northampton Polytechnic, London, by Dr. Robert Pohl, lecturer in machine design at Birmingham University. The first lecture was on February 24th and the remaining two are to be given on March 3rd and 10th. Admission is free.

Employment of Women

As we stated in our February 5th issue the Employment of Women (Control of Engagement) Order, 1943, which came into operation on February 22nd. requires all women between the ages of 18 and 40 to obtain employment through a local office of the Ministry of Labour and National Service and employers can only engage them through a local office.

The Ministry informs us that this does not preclude such women from changing their employment, they are free to leave their jobs unless they come within the scope of an Essential Work Order. The aim is to ensure that women are placed in positions in which they are most needed in the national interest.

Standard Specification Amendments

Among the amendment slips to British Standard Specifications issued during January are the following:—P.D. 55, B.S. 263—1931, Brazing Solder; P.D. 59, B.S. 445—1932, Copper Commutator Bars; P.D. 60, B.S. 518—1933, Medium-hard Copper Strip, Bars and Rods; P.D. 61, B.S. 444—1932, Copper for Winding of Electrical Machines; and P.D. 74, B.S. 148—1933, Insulating Oils. Copies of the slips will be sent gratis on receipt of a stamped addressed envelope to: The British Standards Institution, 28, Victoria Street, London, S.W.1.

Industrial Management Conference

A conference on training for industrial management is being held by the Institute of Industrial Administration from March 5th to 7th at the Waldorf Hotel, London, W.C.2. The relationship between management and the people and the position of management in industry will be discussed, and papers will deal with British and American developments in education for management, and with training for supervisory and executive positions and the board room. The speakers will include the Archbishop of Canterbury.

Fatal Shock from Vacuum Cleaner

Sheriff Hamilton at Paisley on February 12th returned an open verdict after hearing evidence at an inquiry into the death of a servant girl from electric shock. The girl, it was stated, was using a vacuum cleaner on a verandah, the stone floor of which was wet. She fell when she was going to switch off the cleaner. A neighbour who went to the girl's assistance stated that when he tried to lift the cleaner he got a shock. A detective-constable said he found one of the connections of the switch inside the vacuum cleaner handle had worked loose. If the cleaner had had the customary non-conducting attachment on its handle there would have been no shock, provided no other part of the cleaner was touched, but this attachment was missing.

Television in South Africa

The introduction of television in South Africa after the war is being considered, states *Reuter*. Professor L. Fouche, chairman of the South African Broadcasting Corporation, says that programmes will not only be drawn up on an entertainment basis, but will also provide material for teaching in schools. He predicts that five years after the war, television will be as popular as the wireless is to-day.

Overhead Line Data

A new publication by the Copper Development Association entitled "Overhead Lines Loading Tables" should save appreciable time and labour in making design calculations. The first table gives the maximum loading conditions permitted by official regulations in

most parts of the British Empire, taking into account the amended conditions approved by the Electricity Commissioners for this country. The other three tables deal with the loading with ice at 8 lb. per sq. ft. and without ice at various wind pressures, for hard-drawn, cadmium and steel-cored copper for conductor sizes corresponding to those of B.S. 125, 672 and 837. Copies are available from the Association at 8, Bilston Road, Rugby.

Change of Address

The Leicester warehouse of the Nottingham branch of the associated companies, the London Electric Wire Company and Smiths, Ltd., Frederick Smith & Co., the Liverpool Electric Cable Co., Ltd., and Vactite Wire Co., Ltd., has been removed to "Lewcos House," Queen Street, Leicester (telephone: Leicester 20022).

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of February 17th:—

QUALCAST. No. 621,152. Class 9. Flat irons, vacuum cleaning apparatus and carpet sweepers and cleaners, all being electrical goods.—Qualcast, Ltd., Victory Road, Derby. To be associated with No. 522,875 (2778) vi and another.

JONELL. No. 617,992. Class 9. Electric lighters for smokers and for gas; electric soldering irons, electrical apparatus for domestic and household purposes not included in other classes, and electric heating elements for all these goods; electric plugs and adaptors, electric vacuum cleaners and sweepers, electric floor polishers, and electric torch lamp batteries; scientific, nautical, surveying, photographic, cinematographic, optical and wireless instruments and apparatus; and fire extinguishing apparatus.—John Lewis & Co., Ltd., 13, Holles Street, London, W.1. To be associated with No. 620,712 (3386) xi and others. (By consent).

ALPHAX. No. 621,594. Class 9. Electric dry cells and dry batteries.—Alpha Accessories, Ltd., Lockfield Avenue, Brimsdown, Enfield, Middlesex. To be associated with No. 600,040 (3161) ix and another.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

BILSLAND drill—last known as at Aintree, Liverpool.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, March 4th, 5 p.m. Films on Sir J. J. Thomson and Lord Rutherford. 5.30 p.m. Paper: "Air-blast Circuit-breakers," by Mr. A. R. Blandford.

Wireless Section.—March 3rd, 5.30 p.m. Paper: "Amplifying and Recording Technique in Electro-Biology," by Messrs. G. Parr and W. Grey Walter.

Measurements Section.—Friday, March 5th, 5.30 p.m. Informal discussion on "Experiences with Pivots and Jewels in Wartime," to be opened by Mr. G. F. Shotter.

Transmission Section.—Wednesday, March 10th, 12.30 for 1 p.m. Informal luncheon at Connaught Rooms, W.C.2. 5.30 p.m. (at I.E.E.). Paper: "The Ventilation of Sub-stations," by Messrs. F. Favell and E. W. Connon.

West Wales (Swansea) Sub-Centre.—Saturday, February 27th, 3 p.m. (revised date). Mackworth Hotel, High Street, Swansea. Lecture on "Automatic Boiler Control," by Mr. E. J. Clifton.

London Students' Section.—Monday, March 1st, 7 p.m. Paper: "A Gas-filled Cable System," by Mr. B. Calvert.

South Midland Centre.—Monday, March 1st, 6 p.m. James Watt Institute, Birmingham. Paper: "Air-blast Circuit-breakers," by Mr. A. R. Blandford.

North Midland Students' Section.—Saturday, March 6th, 2.30 p.m. Griffin Hotel, Leeds. Problems afternoon.

Western Centre.—Monday, March 8th. Bristol. Paper: "Factors Affecting the Unification of Electricity Supply Tariffs," by Mr. C. T. Melling.

North-Eastern Centre.—Monday, March 8th, 6.15 p.m. Neville Hall, Newcastle-on-Tyne. Papers on tariffs by Messrs. P. Schiller and C. T. Melling. *Students' Section.*—Friday, March 5th, 6.30 p.m. Paper: "Notes on Thermal Power Station Performance," by Messrs. M. N. Karaosman and G. T. Shears.

Electrodepositors' Technical Society.—Monday, March 1st, 2.30 p.m. Chemical Society's Rooms, Burlington House, W.1. Paper: "The Electrolytic Polishing of Metals," by Dr. S. Wernick (Joint meeting with Society of Chemical Industry).

Midlands Centre.—Tuesday, March 2nd, 5 p.m. James Watt Memorial Institute, Birmingham. Paper: "Protective Immersion Treatments," by Mr. C. Harris.

Institute of Metals.—Wednesday, March 3rd, 3 p.m. Annual general meeting, followed by presentation of the Institute Medal to Dr. H. Moore, and short papers. 5.30 p.m., Roberts-Austen Centenary Lecture by Dr. S. W. Smith, C.B.E. (open to non-members).

Royal Society of Arts.—Mondays, March 15th, 22nd, 29th and April 5th, 1.45 p.m. Cantor Lectures on "The Modern Power Station." The first lecture on "The Boiler House" is to be given by Mr. E. L. Luly (Babcock & Wilcox, Ltd.).

Institute of Welding.—Tuesday, March 2nd, 6 p.m. Institution of Mechanical Engineers, Storey's Gate, S.W.1. Repeat of series of papers on developments in arc-welding technique. Admission by ticket only.

American Exports

Increased Electrical Shipments in 1940

PROBABLY for the last time until after the war is over, details of the foreign trade of the United States, showing countries of origin and destination, have been issued in Washington. They refer to 1940. From this statement the following figures showing the values in that year of the principal electrical exports of the United States, with the leading destinations, have been extracted, and notes of increases or decreases on 1939 have been added.

The total increase was approximately 10 per cent. and was spread fairly widely over the whole trade. Among the few noteworthy groups showing decreases were batteries (other than storage), refrigerators and parts, domestic appliances, steam turbine generators and razors. Prominent among the increases were AC generators, welding sets, self-contained lighting sets, instruments, motors, control gear and parts, searchlight and airport beacons, and various accessory material.

The exports were very widely distributed. Canada retained her position as the best customer of her great southern neighbour, while Great Britain came next, the respective increases being about 40 and 25 per cent. Among the important South American markets Brazil ranked highest, though showing a small decrease. On the other hand both Argentina and Mexico showed advances of about 25 per cent. South Africa was the fourth largest customer. Other noteworthy market fluctuations were increases of about 60 per cent. and 30 per cent., respectively, in exports to China and the Netherlands East Indies, and a fall of over 20 per cent. in those to India.

	1940 $ (000)	Inc. or dec. on 1939
Generators, DC—		
Total	870	+ 490
To Canada	103	+ 32
„ Britain	353	+ 349
„ Brazil	72	+ 35
Generators, AC—		
Total—	1,725	+ 979
To France	140	+ 136
„ Kwantung	827	+ 800
„ Colombia	143	+ 131
Steam turbo-generator sets, under 500 kW—		
Total	63	− 198
To Canada	14	+ 6
„ Mexico	12	+ 3
„ Brazil	16	− 172
ditto, 500 kW and larger—		
Total	686	− 1,494
To Canada	154	+ 154
„ Mexico	119	+ 111
„ Brazil	214	− 1,606
Accessories and parts for generators—		
Total	1,088	+ 237
To Canada	151	+ 89
„ Argentina	213	+ 168
„ Brazil	179	− 66
Welding sets—		
Total	1,667	+ 628
To Canada	408	+ 220
„ Argentina	125	+ 52
„ Brazil	129	− 84
„ South Africa	155	+ 115
Self-contained lighting sets—		
Total	2,893	+ 1,367
To Canada	145	+ 76
„ Britain	1,347	+ 1,302
„ Brazil	126	+ 65
„ N. E. Indies	157	+ 124
„ Venezuela	167	− 52
Wind-driven generators—		
Total	481	− 91
To Canada	70	− 45
„ Argentina	195	+ 6
„ S. Africa	72	+ 13
Storage batteries—		
Total	2,515	+ 110
To Canada	120	+ 24
„ Mexico	78	− 11
„ Argentina	60	—
„ Chile	204	+ 106
„ India	137	− 35
Other batteries, including flashlight—		
Total	3,326	− 725
To Britain	1,318	+ 266
„ Colombia	258	− 50
„ Venezuela	250	+ 13
Power transformers, over 500 kVA—		
Total	366	− 409
To Canada	20	+ 20
„ Brazil	94	− 159
„ Colombia	52	+ 31
Distribution transformers, 500 kVA and less—		
Total	952	+ 360
To Mexico	103	+ 64
„ Panama Canal Zone	152	+ 135
Instrument transformers—		
Total	157	+ 42
To Canada	6	+ 2
„ Brazil	43	+ 38
Mercury power rectifiers—		
Total	147	+ 124
To Canada	129	+ 127
Convertors—		
Total	735	+ 105
To Canada	239	+ 151
„ Chile	74	+ 70
Complete battery chargers, non-rotating—		
Total	244	− 11
To Canada	44	+ 3
„ S. Africa	28	− 3
Switchboard panels, except telephone—		
Total	1,001	+ 183
To Canada	92	+ 52
„ Brazil	116	− 165
„ Colombia	117	+ 106
Circuit-breakers and switches over 10 A—		
Total	1,860	+ 85
To Canada	668	+ 400
„ Brazil	260	− 36
Fuses—		
Total	216	+ 11
To Canada	27	+ 3
„ Mexico	24	− 2
Testing, measuring and indicating instruments—		
Total	3,701	+ 746
To Canada	1,261	+ 579
„ Argentina	174	+ 39
„ Brazil	163	+ 17

(*Continued on next page*)

American Exports (*Continued from preceding page*)

	1940 $ (000)	Inc. or dec. on 1939
Lightning arrestors, choke coils, reactors and parts—		
Total	520	+ 67
To Canada	109	+ 51
„ Brazil	53	+ 2
„ S. Africa	55	+ 22
Motors, under 1 HP—		
Total	1,355	+ 161
To Canada	480	+ 26
„ Argentina	158	+ 46
„ Brazil	93	+ 26
„ Colombia	63	+ 49
Stationary motors, 1-200 HP—		
Total	2,485	+ 1,005
To Canada	437	+ 255
„ Britain	532	+ 488
„ Mexico	107	— 11
„ Brazil	214	+ 91
„ Chile	122	+ 86
ditto, over 200 HP—		
Total	585	+ 113
To Canada	32	+ 21
„ Britain	79	— 89
„ Japan	59	+ 12
„ Soviet Russia	85	— 83
Elec. locos, railway, mining and industrial—		
Total	756	+ 31
To Canada	138	— 15
„ Brazil	160	— 168
„ Australia	121	+ 16
Elec. industrial trucks and tractors—		
Total	505	+ 38
To Canada	172	+ 132
„ Soviet Russia	139	— 155
Starting and controlling equipment for industrial motors, and parts—		
Total	2,260	+ 740
To Canada	848	+ 500
„ Soviet Russia	404	+ 154
Accessories and parts for motors—		
Total	2,077	+ 587
To Canada	659	+ 254
„ Britain	187	— 39
„ Chile	202	+ 3
„ Japan	157	+ 149
Portable elec. tools—		
Total	1,670	+ 236
To Canada	583	+ 200
„ Britain	336	— 43
„ Brazil	117	+ 69
Household refrigerators—		
Total	8,076	— 1,464
To Canada	1,107	+ 402
„ Mexico	605	+ 186
„ Cuba	541	+ 66
„ Brazil	1,132	+ 243
„ S. Africa	877	— 109
Commercial refrigerators up to 1 ton—		
Total	1,352	— 439
To Canada	185	— 15
„ Venezuela	131	+ 41
„ Brazil	95	— 10
„ Mexico	80	+ 22
Parts for elec. refrigerators—		
Total	4,840	— 1,213
To Canada	1,979	+ 1,779
„ Argentina	807	+ 753
„ Australia	183	+ 172
„ S. Africa	248	+ 153
Electric fans—		
Total	537	— 65
To Canada	69	— 7
„ Mexico	41	+ 9
„ Brazil	57	+ 29
Lamps for automobiles, flashlights, etc.—		
Total	757	+ 352
To Britain	217	+ 190
„ S. Africa	64	+ 36
Other electric lamps—		
Total	1,421	+ 278
To Canada	205	+ 26
„ Chile	107	+ 38
„ Colombia	117	+ 42
Searchlight and airport beacons—		
Total	3,391	+ 3,143
To Canada	2,184	+ 2,164
„ France	912	+ 741
„ Brazil	206	+ 205
Domestic motor-driven devices including washing machines, vacuum cleaners and parts—		
Total	2,345	— 1,210
To Canada	1,334	+ 84
„ Brazil	85	+ 44
„ Mexico	155	+ 4
Electric flat irons—		
Total	250	— 30
To Mexico	45	+ 10
„ S. Africa	40	+ 6
Heating or cooking devices—		
Total	1,278	+ 189
To Canada	388	+ 45
„ Mexico	69	+ 2
„ Colombia	67	— 38
„ S. Africa	120	— 10
Furnaces and other industrial heating devices and parts—		
Total	1,771	+ 81
To Canada	480	+ 285
„ Soviet Russia	777	— 111
Therapeutic apparatus and parts—		
Total	2,414	+ 212
To Canada	588	— 12
„ Britain	318	+ 73
„ Mexico	183	+ 46
Radio apparatus and parts—		
Total	22,039	— 142
To Canada	2,876	+ 320
„ Argentina	1,385	+ 9
„ Brazil	2,000	+ 115
„ Venezuela	685	+ 2
„ China	415	— 21
„ S. Africa	1,463	— 6
„ Britain	2,241	— 87
Other telegraph and telephone apparatus and parts—		
Total	4,577	+ 918
To Canada	1,758	+ 481
„ China	682	+ 664
„ Burma	165	+ 165
„ Brazil	284	+ 142
Bells, buzzers and alarms—		
Total	375	+ 107
To Canada	252	+ 83
Starting, lighting and ignition equipment—		
Total	1,179	+ 17
To Canada	559	+ 142
„ Brazil	91	+ 19
„ Australia	53	— 6
„ Britain	44	— 1
Insulating material—		
Total	560	+ 153
To Canada	172	+ 29
„ Argentina	48	+ 34
„ S. Africa	30	+ 15
Metal conduit, outlet and switch boxes—		
Total	1,386	+ 276
To Canada	311	+ 176
„ Mexico	77	+ 18
„ Argentina	80	+ 20
„ Brazil	209	+ 13
Wiring supplies and line material—		
Total	5,505	+ 1,333
To Canada	1,939	+ 529
„ Mexico	437	+ 147
„ Argentina	206	+ 106
„ Venezuela	252	+ 80
Electric razors—		
Total	147	+ 771
To Canada	43	— 51
Other elec. apparatus—		
Total	13,566	+ 3,852
To France	954	+ 813
„ Britain	4,383	+ 1,166
„ Canada	3,216	+ 942
„ Australia	383	+ 47
„ S. Africa	492	+ 194
„ Argentina	560	+ 148

ELECTRICITY SUPPLY

Reward for Economy. Avoiding Dual Meters.

Belfast.—EXTENSION OF "STARLIGHTING."—At a special meeting of the Police Committee it was decided to install several hundred new "starlights" in the main roads leading to the centre of the city.

Exeter.—RATE CONTRIBUTION.—The Electricity Committee has made a contribution of £2,360 to the general rate fund.

Gainsborough.—CONSUMERS REWARDED.—The response of small consumers to the Council's appeal that they should reduce to the minimum their use of electrical energy between 8 a.m. and noon, so making an increased supply available for war industries throughout the country, has been acknowledged in an acceptable manner. At the last meeting of the U.D.C. it was announced that this restricted use, combined with economies within the Electricity Department, had made it possible for the Electricity Committee to recommend that small users (on flat rate lighting, business premises, rateable value, small industrial power, and heating tariffs) should be given a discount of 33⅓ per cent. for the March quarter instead of the usual cash discount of 2½ per cent. Prepayment meter consumers would receive a further 1½d. per kWh cash return during the two months to March 31st, 1943. Apart from these concessions it was recommended that in subsequent quarters until further notice small consumers should receive, in addition to the usual cash discount of 2½ per cent., a supplementary discount of 7½ per cent., making 10 per cent. in all, the Committee expressing the hope that they would continue to restrict consumption between 8 a.m. and noon or at other periods as requested from time to time. The recommendations were approved by the Council and it was unanimously resolved to place on record the Council's appreciation of the services of the electrical engineer and manager, Mr. R. C. Hammersley.

Glasgow.—ELECTRODE BOILERS.—With a view to the original scheme for the installation of three electrode boilers in the laundry at Hawkhead Mental Hospital being proceeded with, further representations are to be made by the Corporation and, if necessary, the Department of Health will be interviewed on the subject.

Paisley.—FOOD ADVICE CENTRE.—It is understood that no further action will be taken by the Town Council in its protest to the Ministry of Food and the Ministry of Fuel and Power against the establishment in the town of a food advice centre. This view has been expressed by the convener of the Electricity Committee who, however, maintains that the advice centre is "a little unnecessary." The Provost has pointed out that the demonstrations being given by the Corporation are confined to cooking by electricity, whereas at the advice centre cooking by gas is also demonstrated. The protest arose from a recommendation by the Electricity Committee following a report by the electricity manager that the centre was really a duplication of a service already provided by the Electricity Department.

Stockton-on-Tees.—METER PROBLEM. — The borough electrical engineer recently reported that a number of consumers had asked to be transferred from the domestic to the flat rate. This would, he said, necessitate the installation of two meters, one for lighting and one for heating, and in view of the shortage of meters, he suggested that a compromise should be made by charging domestic consumers a definite number of units at the lighting rate of 3½d. per kWh and the remainder at the heating rate of 1½d. per kWh on one meter. This would obviate the necessity of altering the meters. The report has been approved.

Sunderland. — INDUSTRIAL SUPPLIES. — The Electricity Committee has approved the spending of £300 and £765 on supplying electricity to two industrial undertakings.

TRANSPORT

Belfast.—NEW TROLLEY-BUS SERVICE.—On March 1st a trolley-bus service is to be put into operation on the Albert Bridge (Dundonald) route, thus completing that section in and out from the city centre, the first phase having been *via* the Queen's Bridge. This change will mark another stage in the £1,250,000 scheme initiated by the Corporation early in 1939. Five of the six services on the east side of Belfast have been converted to trolley-bus operation, the only tram route remaining being the Bloomfield service. Dundonald, Stormont, Castlereagh and Cregagh have trolley-bus services, while Ravenhill is served by petrol-driven buses.

Eire.—FIRST ELECTRIC FERRY.—The first electric ferry boat in Eire was formally put into service on February 15th, plying between Waterford City and Co. Kilkeeny across the River Suir. The boat makes the return voyage in 6½ minutes. The City manager of Waterford said that the Corporation had been losing about £700 a year on the old row-boat ferry, and would save at least £300 per annum on the new service. In his opinion, locally produced electricity was more economical than internal-combustion engines. The service has given every satisfaction since it was inaugurated.

Newcastle-on-Tyne.—NEW TROLLEY-BUSES.—The City Council has been allocated five new double-decker trolley-buses by the Ministry of War Transport. The chassis will be built by Karrier Motors, Ltd., at a cost of £1,737 each.

Generators "Seized"

LEGAL difficulties which might cause months of delay have been avoided by the "seizure" of two 35,000-kW turbo-generators in the Long Beach No. 2 steam plant of the Southern California Edison Co. for shipment to Russia. It was found that the Russian requirements could best be suited by taking these units, which conformed both in size and frequency to the specification. The alternative would have been a long wait while new units were constructed. The generators were installed originally in 1925.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

English Electric Co., Ltd.—The accounts for the year ended December 31st now published confirm the preliminary figures given in our issue of February 12th. The trading profit after providing for taxation, and including dividend receivable from D. Napier & Son, Ltd., amounts to £559,370, an increase of £44,049 as compared with 1941. Debenture interest requires £46,310, directors' remuneration £5,250, trustees' fees £250 and depreciation £100,000, leaving a net profit of £407,560 (against £362,604). To this is added £51,018 brought in, leaving a balance of £458,578. It is proposed to place £100,000 to general reserve and to maintain the dividend on the ordinary stock for the year at 10 per cent., leaving £53,030 to be carried forward.

During the year the company acquired a controlling interest in D. Napier & Son and holders of over 90 per cent. of the ordinary shares of that company have accepted the offer to exchange their holdings for ordinary stock of the English Electric Co.

The Westinghouse Brake & Signal Co., Ltd., held its annual meeting on February 16th when Lord Southborough (chairman) said that their activities during the year had resulted in the highest total output in the history of the company. Every side of their activities had been fully extended and the results had been most satisfactory. Early in 1942 they instituted a production committee to which representatives of the workpeople were elected. The representatives sat in conference with the works management and their experience had been that the committee had proved itself to be a success. It had also been decided to form a similar committee on which representatives of the superintendents of shops, foremen, assistant foremen and chargehands would sit with the works management.

Capt. B. H. Peter (managing director) said that at the request of their employees a special production week was planned during December and, although the works were closed over Christmas for two and a half days, their total production for that month exceeded any production that had ever been reached in the history of the company in a single month.

The Consolidated Signal Co., Ltd., proposes to pay an ordinary dividend of 24 per cent., less tax, for the year to September 30th (against 17 per cent. for the previous year). The net profit for the year is £24,302 (against £19,957).

Whitehall Electric Investments, Ltd.—At an extraordinary meeting and separate meetings of the preferred and ordinary stockholders on February 17th the board's proposals for the reorganisation of the capital (see *Electrical Review*, January 29th, page 159) were approved. In explaining the proposals the chairman (the Hon. Clive Pearson) said that no ordinary dividend had been paid since 1933 owing to reduced income and depreciation of investments. The sale, at a heavy loss, of the company's property in Spain, and cash and gilt-edged securities held by the company had resulted in there being considerable cash resources which could not be usefully employed in the existing unfavourable conditions.

The scheme put forward sought to be just between the stockholders and if adopted would strengthen the company's position. He thought that after the scheme had been carried through the capital value of the ordinary stock would improve, and there was a prospect that the reduction suffered by the preference stockholders would be made good by a payment on the ordinary stock which they would receive under the scheme.

The London Passenger Transport Board reports that the net revenue for 1942, after giving effect to pooling arrangements and including a profit on the realisation of investments and the balance of the London Transport "C" stock interest fund, amounted to £4,882,917, an increase of £38,258 as compared with 1940. Interest on the prior charge London Transport stocks requires £4,080,487, leaving for the service of the "C" stock £802,470 (against £764,212). The final payment on the "C" stock is 1¾ per cent., making 3 per cent. for the year (against 2⅞ per cent.), and the £31,506 remaining has been transferred to the "C" stock interest fund.

The Southern Railway Co. reports a net revenue for 1942 of £6,913,514, a decrease of £20,746 as compared with the preceding year, to which is added £101,336 brought in, making £7,014,850 (against £7,026,190). After meeting interest and dividends on the pre-ordinary stocks, it is proposed to pay a final preferred ordinary dividend of 2½ per cent., making 5 per cent., and a deferred ordinary dividend of 1¾ per cent. for the year. Similar payments were made for the previous year. The balance carried forward is £89,996.

R. B. Pullin & Co., Ltd., report a trading profit for the year to October 31st of £107,087, as compared with £99,873 for the preceding year, and after deducting depreciation and directors' fees there is a net profit of £98,580 (against £91,964). Provision for tax absorbs £68,500, and the final dividend is 15 per cent., making 20 per cent., less tax, for the year (same). General reserve receives £10,000 and the balance carried forward is £1,407 (against £1,327 brought in).

Mather & Platt, Ltd., state that their net profit for 1942 was £171,545, after providing for taxation and exceptional wartime items, an increase of £15,479 upon the 1941 figure. As was reported last week, the ordinary dividend is maintained at 10 per cent. and a distribution of 1 per cent. (not subject to tax) is to be made from special reserve on account of realised capital profits. The amount carried forward is raised from £74,557 to £89,736.

The County of London Electric Supply Co., Ltd., is paying a final ordinary dividend of 5 per cent., making 8 per cent. for 1942 (unchanged).

STARTERS

A full range is available, including all types, for A.C. and D.C. Motors, Hand Operated, Automatic, Air, and Oil Break.

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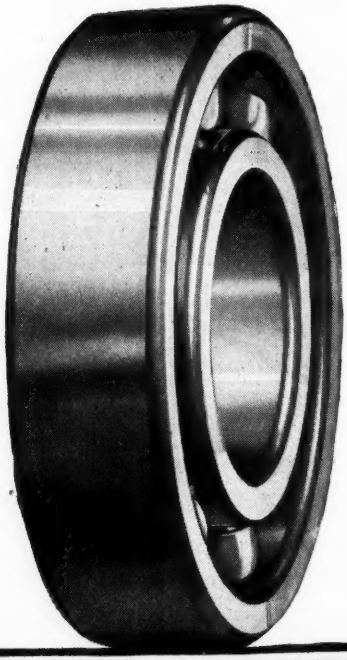

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ALL-BRITISH
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Associated with British Timken Ltd.

The Power Securities Corporation, Ltd., reports the settlement of a number of outstanding taxation claims during the past year; a repayment of £37,710 has been placed to a contingency account. The gross profit for 1942 was £118,492 (against £124,680) and after meeting expenses and adding £50,664 brought forward there was a balance of £29,239 (against £18,704). The ordinary dividend is maintained at 6 per cent. and £38,403 is carried forward. The value of investments (other than that in Italy which has been written down to £480,336) is believed to be in excess of the balance sheet valuation.

The Ransome & Marles Bearing Co., Ltd., has declared an interim dividend of 9 per cent. (against 5 per cent. last year).

The Clyde Valley Electrical Power Co., is paying a final dividend of 5 per cent., again making 8 per cent. for the year.

The Electrical Distribution of Yorkshire, Ltd., has announced a final dividend of 4½ per cent. making 9 per cent. for the year (unchanged).

The American Telephone & Telegraph Co., is paying the regular quarterly dividend of $2.25.

New Companies

Heating Equipment, Ltd.—Private company. Registered February 13th. Capital, £1,000. Objects : To carry on the business of manufacturers of, and dealers in, electrical and other heating equipment, surgical and dental appliances, etc. Directors : G. B. White, The Cottage, Willenhall Avenue, New Barnet, Herts and R. C. Cox, 70, Park Avenue, Orpington, Kent. Registered office : 8, Lucerne Road, Orpington, Kent.

Instrument Repairs, Ltd.—Private company. Registered February 13th. Capital, £1,000. Objects : To carry on the business of manufacturers and repairers of, and dealers in, electrical instruments, apparatus and appliances, etc. Other particulars similar to Heating Equipment, Ltd.

Companies' Returns

Statements of Capital

Hewittic Electric Co., Ltd.—Capital, £50,000 in 1,400 redeemable preference and 48,600 ordinary shares of £1. Return dated August 12th. 1,300 preference and 40,000 ordinary shares taken up. £40,000 paid on the ordinary shares. £1,300 considered as paid on the preference shares. Mortgages and charges : Nil.

Thorn Electrical Industries, Ltd.—Capital, £150,000 in 50,000 preference shares of £1 and 400,000 ordinary shares of 5s. Return dated September 7th. All shares taken up. £63,150 paid on 50,000 preference and 52,500 ordinary shares. £86,850 considered as paid on 347,400 ordinary shares. Mortgages and charges : Nil.

Raydex Electric Heaters, Ltd.—Capital, £2,000 in £1 shares. Return dated September 8th. 2 shares taken up. £2 paid. Mortgages and charges : Nil.

Pirelli, Ltd.—Capital, £400,000 in £1 shares. Return dated September 15th. All shares taken up. £400,000 paid. Mortgages and charges : £150,000.

Submarine Signal Co. (London), Ltd.—Capital, £1,000 in £1 shares. Return dated September 9th. All shares taken up. £1,000 paid. Mortgages and charges : Nil.

Ionlite, Ltd.—Capital, £30,000 in £1 shares. Return dated September 2nd. All shares taken up. £28,000 paid. £2,000 considered as paid. Mortgages and charges : Nil.

Globe Electrical Co., Ltd.—Capital, £3,500 in £1 shares. Return dated September 16th. 3,000 shares taken up. £3,000 paid. Mortgages and charges : Nil.

Mortgages and Charges

Adelaide Electric Supply Co., Ltd.—Issue on January 25th, 1943, of £250,000 3½ per cent. "J" consolidated debenture stock (Australian stock), part of a series already registered.

Altrincham Electric Supply, Ltd.—Satisfaction to the extent of £10,000 on January 20th, 1943, of charge registered July 19th, 1939.

E. Dawson (Lamp Factors), Ltd.—Satisfaction to the extent of £5,000 on August 25th, 1942, of a series of debentures authorised December 5th, 1938, and registered December 13th, 1938. (Notice filed February 15th, 1943.)

Newton Distributors (Manchester), Ltd.—Satisfaction in full on September 29th, 1939, of debenture dated April 5th, 1937, and registered April 7th, 1937, securing £2,200. (Notice filed February 12th, 1943.)

A. Saunders, Ltd.—Satisfaction in full on October 15th, 1942, of charges dated August 2nd, 1940, and October 28th, 1940, and registered August 20th, 1940, and November 18th, 1940, each securing all moneys due or to become due from the company to Barclays Bank, Ltd.

Private Arrangement

Electrical Utilities, Ltd.—A meeting of the creditors was convened under Section 238 of the Companies Act, 1929, for February 10th at the Incorporated Accountants' Hall, Victoria Embankment, London, W.C., but was later cancelled, a circular having been issued by the secretary of the company stating that a winding-up order had been made against the concern. A private conference of the creditors was held in January last, when an approximate balance sheet was submitted which showed liabilities of £20,640. The assets were £27,719, and there was a credit balance on the profit and loss account, subject to further income tax reserve, of £7,069.

The compulsory winding-up order was recorded in our last issue.

Bankruptcies

E. S. Cheatle (Apex Radio & Electrical Service), radio and electrical dealer, 580, Coventry Road, Small Heath, Birmingham.—First and final dividend of 1s. 7¾d. in the £ payable March 26th at 37, Temple Street, Birmingham.

F. W. Hodges, electrical engineer, 9a, Station Hill, Kidderminster.—Supplemental dividend of 7s. 4d. in the £, payable March 2nd, at 1, Priory Street, Dudley.

STOCKS AND SHARES

TUESDAY EVENING.

THE debate on the Beveridge Report reacted to some extent upon Stock Exchange markets, introducing an element of uncertainty with regard to the domestic political outlook. And when uncertainty prevails, the Stock Exchange markets tread cautiously. Home electricity supply companies are declaring the same dividends as those of a year ago, and this has had a strengthening effect upon quotations. The cable group is quiet and uninteresting.

Home Railway Dividends

The Home Railway market supporters were disappointed with the dividends declared by the Southern Railway and the London and North Eastern. In the previous week, the London, Midland and Scottish had exceeded favourable expectations by raising its dividend to 2½ per cent. on its ordinary stock. This served to fan an optimism that proved to be unjustified, and upon the later announcements the junior stocks in the railway market fell heavily. Even the increase from 4 to 4½ per cent. on the Great Western consolidated ordinary stock did not arrest the movement. For instance, Southern Railway preferred stock suffered a loss of 1¼, at 76, ex dividend. The London Passenger Transport Board declared a final dividend for the year, making 3 per cent. on the " C " stock, as most people had expected. The price dropped 2, to 57xd. The Board's net revenue shows an increase for 1942 of £38,258. By comparison with other junior stocks in the Home Railway market, Transport " C " still looks expensive on the yield basis, but supporters of the stock point to the prospects of after-war developments.

Victory's Wings

In connection with the modesty of the returns afforded by many of the best-class shares at the present time, it is pertinently asked whether proprietors might not be well advised to take advantage of the high prices to sell their shares and to put the money into one or other of the various forms of war borrowing. The Defence and the Savings Bonds pay 3 per cent., National War Bonds 2½ per cent. Gilt-edged debenture stocks return about 3¼ per cent. and the front rank preferences pay rather more.

Owing to the financial policy of the Government during the war, prices of gilt-edged stocks have been run up to an artificial level. The difference between 3 per cent. on Defence and Savings Bonds, and 3¼ per cent. on a debenture stock, is so slight that the holder of the latter, anxious to do all he can do to ensure a huge success for " Wings for Victory " week, suffers little loss if he carries out his patriotic intention by making the exchange. The Government loans mostly carry fixed dates for redemption, and there are austere investors who decline to look at any security unless it has a settled term of maturity.

Price Fluctuations

The changes in prices on the week are comparatively insignificant. General Electrics advanced to 89s.; British Vacuum Cleaner to 22s. 6d.; and British Aluminium to 50s. Hopkinsons at 58s. are 1s. better. On the other hand, Lucas eased off to 72s. 6d. after their recent rise, and Henley's, at 25s., have gone back 9d., while Ever Ready at 38s. 6d. are also a shade easier. Cable stocks keep steady. In the traction market, Cape Electric Trams at 24s. 6d. are up a florin, and Bristol Trams regained most of their dividend at 52s. xd. West Ridings at 41s. are 1s. to the good. In the Home electricity group, Edmundsons are better at 29s. 6d.; Llanelly put on 1s. 6d. at 24s.; Bournemouth & Poole held their improvement at 61s. 3s.; Clyde Valley shares have strengthened to two guineas. North Easterns and Northmets are harder. The only noticeable change in the overseas group is a rise of 1s. 6d. to 32s. 6d. in Palestine Electric " A " shares.

Electricity Supply

The County of London Electric Supply Co. has declared the usual dividend making 8 per cent. for the year, and several of the other Home electricity supply undertakings have repeated their final distributions to make up the customary annual dividends. Most of the companies have maintained the dividends which they had been paying before the war. This is in marked contrast to the experience of some of the gas companies. A fortnight ago, the Gas Light & Coke and the South Metropolitan Gas Companies surprised and pleased their stockholders by resuming dividends on the preference stocks; and, in addition, by paying 1 per cent. on the ordinary shares. Ironically enough, the price of gas ordinary shares has since declined. Except for an occasional, and comparatively slight setback, prices of electricity supply companies have remained firm during the whole period of the war.

English Electric

The English Electric Co. has announced that holders of over 90 per cent. of Napier ordinary shares accepted the offer to exchange their holdings for English Electric ordinary stock. The control acquired represents nearly half a million pounds of Napier ordinary. The English Electric net profits are £45,000 higher on the year, and the 10 per cent. dividend is amply protected by the margin left over after the payment. The company's financial strength is illustrated by the net

(*Continued on page* 304)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price Feb. 23	Rise or Fall	Yield p.c. £	s.	d.
Home Electricity Companies							
Bournemouth and Poole	12½	12½	61/3	..	4	1	7
British Power and Light	6	6	29/6	..	4	1	4
City of London	7	7	32/6	..	4	6	2
Clyde Valley	8	8	42/–	+6d.	3	16	2
County of London	8	8	42/6	..	3	15	2
Edmundson's:							
7% Pref.	7	7	34/–	..	4	2	4
Ord.	6	6	29/6	+6d.	4	1	4
Elec. Dis. Yorkshire	9	9	46/–	+6d.	3	18	3
Elec. Fin. and Securities	12½	12½	51/–	..	4	18	1
Elec. Supply Corporation	10	10	47/–	+6d.	4	5	0
Isle of Thanet	2	Nil	16/–	..		—	
Lancs. Light and Power	7½	7½	37/6	..	4	0	0
Llanelly Elec.	5½	5½	24/–	+1/6	4	11	8
Lond. Assoc. Electric	4½	4	24/–	..	3	6	8
London Electric	6	6	27/–xd	+½	4	9	0
London Power Red. Deb.	5	5	105½	..	4	14	7
Metropolitan E.S.	8	8	42/–	..	3	16	2
Midland Counties	8	8	41/6	..	3	17	0
Mid. Elec. Power	9	9	44/–	..	4	1	9
Newcastle Elec.	7	7	31/–	..	4	10	5
North Eastern Elec. Ordinary	7	7	35/–	..	4	0	0
7% Pref.	7	7	34/6	..	4	1	2
Northampton	10	10	47/6	..	4	4	0
Notting Hill 6% Pref. (£10)	6	Nil	9¾	..		—	
Northmet Power: Ordinary	7	7	40/–	+6d.	3	10	0
6% Pref.	6	6	32/–	..	3	15	0
Richmond Elec.	6	6	27/–	..		—	
Scottish Power	8	8	41/–	..	3	18	0
Southern Areas	5	5	23/6	..	4	5	0
South London	7	7	26/–	..		—	
West Devon	5	5	22/6	..	4	9	0
West Glos.	4½	3½	21/6	..	3	5	2
Yorkshire Elec.	8	8	42/–	..	3	16	2
Overseas Electricity Companies							
Atlas Elec.	Nil	Nil	5/–	..		—	
Calcutta Elec.	7*	7*	35/–	..		—	
Cawnpore Elec.	10	10	28/–	..	7	2	10
East African Power	7	7	31/–	..	4	10	4
Jerusalem Elec.	7	5	24/–	..	4	3	4
Kalgoorlie (10/–)	7½	5	9/–	..	5	11	1
Madras Elec.	6*	4*	24/6	..		—	
Montreal Power	1½	1½	28½	–½	5	5	3
Palestine Elec. "A"	Nil	4*	32/6	+1/6	2	9	3
Perak Hydro-elec.	6	7	9/6	..		—	
Shawinigan Power	83cts.	90cts.	19	–½		—	
Tokyo Elec. 6%	6	6	18½	..		—	
Victoria Falls Power	15	15	78/9	..	3	16	4
Whitehall Inv. Pref.	5	5	23/–	+1/–		—	

Company	Dividend Previous	Dividend Last	Middle Price Feb. 23	Rise or Fall	Yield p.c. £	s.	d.
Public Boards							
Central Electricity: 1955–60 Civil Defence)	—	3	100	+1	3	0	0
1955–75	5	5	116	..	4	6	2
1951–73	4½	4½	108	..	4	3	4
1963–93	3½	3½	104½	+½	3	7	0
1974–94	3½	3½	101	..	3	4	4
London Elec. Trans. Ltd.	2½	2½	96½	..	2	11	10
London & Home Counties 1955–75	4½	4½	110	..	4	1	10
Lond. Pass. Trans.: A	4½	4½	123½	..	3	13	0
B	5	5	121½	..	4	2	4
C	2⅞	3	57xd	–2	5	5	3
West Midlands J.E.A. 1948–68	5	5	110	..	4	11	0
Telegraph and Telephone							
Anglo-Am. Tel.: Pref.	6	6	113½	+½	5	5	9
Def.	1½	1½	29	..	5	3	5
Anglo-Portuguese	8	8	25/–	..	6	8	0
Cable & Wireless: 5½ Pref.	5½	5½	114	+1	4	16	4
Ord.	4	4	77	..	5	4	0
Canadian Marconi $1	Nil	4cts.	7/–	–3d.	2	8	9
Globe Tel. & Tel.: Ord.	8½*	5*	34/–	..	2	18	10
Pref.	6	6	28/6	+6d.	4	4	3
Great Northern Tel.: (£10)	Nil	Nil	24	..		—	
Inter. Tel. & Tel.	Nil	Nil	8	+1		—	
Marconi-Marine	7½	7½	32/6	..	4	12	4
Oriental Tel. Ord.	16	10	38/–	..		—	
Telephone Props.	6	Nil	14/–	..		—	
Tele. Rentals (5/–)	10	10	11/–	..	4	11	0
Traction and Transport							
Anglo Arg. Trans.: First Pref. (£5)	Nil	Nil	5/–	..		—	
4% Inc.	Nil	Nil	15	..		—	
Brit. Elec. Traction: Def. Ord.	45	45	1105	–20	4	1	6
Pref. Ord.	8	8	170	..	4	14	2
Bristol Trams	8	10	52/–xd	+6d.	3	17	1
Brazil Traction	$1½	$1	22¾	..		—	
Calcutta Trams	8	5½	21/6	..	5	2	4
Cape Elec. Trams	5	5	24/6	+2/–	4	3	4
Lancs. Transport	10	10	43/3	..	4	12	4
Mexican Light: 1st Bonds	5	5	97½	..	5	2	7
Rio 5% Bonds	5	5	105½	..	4	14	9
Souther Rly.: 5% Prefd.	5	5	76xd	–1¼	6	11	6
5% Pref.	5	5	116½xd	+ ½	4	5	10
T. Tilling	10	10	53/3xd	–9d.	3	15	1
West Riding	10	10	41/–	+1/–	4	17	7

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Feb. 23	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord.	7½	10	40/–	..	5 0 0
Assoc. Elec. :					
Ord.	10	10	50/6	..	3 19 0
Pref.	8	8	40/–	..	4 0 0
AutomaticTel.&Tel.	12½	12½	56/–	..	4 9 3
Babcock & Wilcox	11	11	50/6	..	4 7 2
British Aluminium	10	10	50/–	+1/–	4 0 0
British Insul. Ord.	20	20	5 3/16	..	3 17 3
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac. Cleaner (5/–)	10	15	22/6	+1/–	3 6 9
Brush Ord. (5/–)	Nil	6	7/9	..	3 17 5
Callender's ..	15	15	80/9	..	3 13 6
ChlorideElec.Storage	15	15	76/3	..	3 18 9
Cole, E. K. (5/–)	7	10	21/3	..	2 7 0
Consolidated Signal	17	24	106/3	..	4 10 7
Crabtree (10/–) ..	17½	17½	38/6	..	4 11 0
Crompton Parkinson Ord. (5/–) ..	30	20	26/–	..	3 17 0
E.M.I. (10/–) ..	6	6	21/6	..	2 17 2
Elec. Construction	10	10	42/6	..	4 14 1
Enfield Cable Ord.	12½	12½	58/6	..	4 5 6
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	47/6	..	4 4 0
Ensign Lamps(5/–)	25	25	18/9	..	6 13 4
Ericsson Tel.(5/–)	22°	20°	47/6	..	2 2 2
Ever Ready (5/–)	40	40	38/6	–6d.	5 4 0
Falk Stadelmann	7½	7½	26/–	..	5 15 5
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C. :					
Pref.	6½	6½	38/3	..	3 18 4
Ord.	20	17½	89/–	+6d.	3 18 8
Greenwood & Batley	15	15	36/6	..	8 4 4
HallTelephone(10/–)	10	12½	24/3	..	5 3 3
Henley's (5/–) ..	20	20	25/–	–9d.	4 0 8
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	15	58/–	+1/–	5 3 5
India Rubber Pref.	5½	5½	20/–	..	5 10 0
Intl. Combustion	32½	30	6½	..	4 16 0
Johnson & Phillips	15	15	67/6	..	4 8 9
Lancashire Dynamo	20	20	4	..	5 0 0
Laurence,Scott(5/–)	15	12½	10/–	..	6 5 0
London Elec. Wire	7½	7½	30/–	..	5 0 0
Lucas, J.	15	15	72/6	–9d.	4 2 9
Mather & Platt ..	10	10	48/3	..	4 3 2
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5 1/16	– 1/16	3 15 6
Pye Deferred (5/–)	25	25	21/3	..	5 17 8
Revo (10/–) ..	20	17½	35/6	..	4 18 7
Reyrolle	12½	12½	65/–	..	3 17 0
Siemens Ord. ..	7½	7½	32/–	–6d.	4 13 9
Smith, S. (1/–) ..	30	37½	9/–	–3d.	4 3 4
Strand Elec. (5/–)	4	7½	7/3	..	5 3 5
Switchgear & Cowans (5/–) ..	15	10	13/6	..	3 14 1
T.C.C. (10/–) ..	5	5	15/–	..	3 6 8
T.C. & M... ..	10	10	47/6	..	3 13 7
Telephone Mfg.(5/–)	9	9	11/6	..	3 18 3
Thorn Elec. (5/–)	20	20	19/3	..	5 4 0
Tube Investments	23¾	20	93/–	..	4 6 0
Vactric (5/–) ..	Nil	Nil	11/6	..	—
Vickers (10/–) ..	10	10	20/–	..	5 0 0
Ward & Goldstone (5/–)	20	20	22/–	..	4 11 0
Westinghouse Brake	10	12½	63/6	..	3 18 9
WalsallConduits(4/–)	55	55	42/–	..	5 4 9
West, Allen (5/–)	7½	7½	7/–	..	5 7 2

* Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from page* 302)

current assets being given as £2,928,700. The price of the shares remains at 47s. 6d. The general tendency of the group is somewhat mixed. Dividend expectations are held responsible for continued absorption of shares; but, considering the claims of E.P.T., hopes of increased dividends are liable to frustration. Somewhat more to the point is the outlook for the industry after the war, and, banking upon this, to-day's investor is content to put up with a modest rate of return —as our tables show—looking to the future for reward for his patience.

Signals and Brakes

The recent raising of the dividend of Westinghouse Brake from 10 per cent. to 12½ per cent. has a natural sequel in an increase in the Consolidated Signal Co.'s dividend from 17 per cent. to 24 per cent. Consolidated Signal has paid 17 per cent. for three years, so that the expansion to 24 per cent. is very welcome to holders who had been anticipating, for some time past, the increased dividend now declared. The price of the shares is nominally unchanged at 106s. 3d., at which the return on the money, on the new dividend basis, comes to a little over 4½ per cent. Westinghouse Brake yield barely 4 per cent. at the present price of 63s. 6d. The Consolidated Signal Co. holds £391,112 Westinghouse Brake ordinary stock.

Whitehall Investments

At the extraordinary general meeting of Whitehall Electric Investments, held last week to consider the resolutions for re-organisation of the company's capital, the proposals were carried in their entirety. The chairman's speech dealt with various criticisms that had arisen in advance. He made it clear that there was a fair prospect of the reduction in the preference dividend being compensated by a dividend upon the ordinary stock, to be transferred in the proportion of £2 of ordinary to £5 of new preference stock. He stated that whereas the old preference stock had a value which, " by reason of our reduced income could only be reckoned as below par, the cash and value receivable by the preference holders under the scheme cannot be assessed at less than 22s. or 23s." The price of the shares, on the strength of this, rose to 23s.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. Brown, Boveri & Cie.—" Combustion turbine plants." 12129/41. October 11th, 1940. (551091.)

A. C. W. Aldis.—" Electric signalling lamps." 6150. February 24th, 1939. (551042.)

Asea Electric, Ltd., and S. Baynes.—" Hoists, cranes, lifts, news-reel stands, and other apparatus requiring quick braking." 14136. November 3rd, 1941. (551061.) " Hoists, cranes, lifts and the like lifting apparatus." 14137. November 3rd, 1941. (551062.)

G. Arrowsmith and Hick, Hargreaves & Co., Ltd.—" Boiler feed-water deaerators of spray or like type." 9843. August 1st, 1941. (550998.) " Boiler feed systems." 14530. November 11th, 1941. (551063.)

R. I. Bagnall and Foster Transformers & Switchgear, Ltd.—" Electric cut-out or protective systems with automatic circuit-breakers." 12014. September 19th, 1941. (551090.)

British Thermostat Co., Ltd., and J. E. Sherlock.—" Snap-action switch mechanism." 11646. September 11th, 1941. (551021.)

British Thomson-Houston Co., Ltd.—" Automatic record changers for phonographs." 12141/41. September 19th, 1940. (551022.) " Magnetic systems for laterally guiding a rotating shaft." 12785/41. October 4th, 1940. (551056.) " Methods of making fluorescent materials." 485/42. January 16th, 1941. (551070.)

British Thomson-Houston Co., Ltd., and L. D. Anscombe.—" Auto-transformers for starting synchronous motors and condensers." 13407. October 17th, 1941. (551029.)

British Thomson-Houston Co., Ltd., H. Trencham and J. R. Mortlock.—" Earth-leakage electric protective arrangements." 13986. October 30th, 1941. (551059.)

Brush Development Co.—" Piezo-electric units." 9850/41. August 2nd, 1940. (551000.)

Brush Electrical Engineering Co., Ltd., and A. C. Morrison.—" Control of electric motors, particularly in vehicles having an electric transmission." 3802/41. April 17th, 1942. (550977.)

Dubilier Condenser Co. (1925), Ltd. (W. Dubilier).—" Machines for assembling electrical condensers." 9846. August 1st, 1941. (550999.)

Holophane, Ltd.—" Luminairs." 4036/42. July 5th, 1941. (551109.)

Igranic Electric Co., Ltd., and W. F. Grafton. —" Electric switches operated by impact or shock." 9746. July 31st, 1941. (551085.)

Johnson Laboratories, Inc.—" Selective high-frequency resonant systems." 6958/41. June 10th, 1940. (551045.)

Lamson Engineering Co., Ltd., and W. J. Stepney.—" Electrical switching apparatus especially adapted for use with pneumatic tube conveying systems." 13775/41. August 19th, 1942. (551058.)

Marconi's Wireless Telegraph Co., Ltd.— " Transmission of picture telegraphy and like signals." 14326/41. November 7th, 1940. (551034.) " Picture telegraphy." 9861/41. August 3rd, 1940. (551087.)

F. R. Mason and Metropolitan-Vickers Electrical Co., Ltd.—" Electric motor control systems for web-winding equipment." 11929. September 17th, 1941. (550964.)

J. O. Ortiz and A. S. Marti.—" Electric switches with rotary contact members." 1034. January 24th, 1942. (550973.)

J. B. Pearson.—" Electric switches for controlling movements of cranes and other mechanism." 13651. October 23rd, 1941. (551032.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Superheterodyne receiving sets." 9661. July 29th, 1941. (550958.) " Cathode-ray tubes, more particularly iconoscopes and circuit arrangements therefor." 10129. August 8th, 1941. (551014.) " Reproduction of sound-track records cut into a carrier or the like." 10130. August 8th, 1941. (551015.) " Flash-light lamps." 10359. August 14th, 1941. (551016.) " Radio receivers." 16374. December 18th, 1941. (551064.) " High-frequency amplifying circuits." 374. January 9th, 1942. (551069.) " Devices for measuring direct voltages." 1970. February 13th, 1942. (551075.) " Plate- or disc-shaped bodies of ceramic material or glass for use in electron-discharge tubes." 16376. December 18th, 1941. (551096.) " Vacuum tight or gas tight seals in electrical apparatus and methods of producing such seals." 9660. July 29th, 1941. (551115.)

Plessey Co., Ltd. (P. R. Mallory & Co., Inc.) —" Electromagnetic interruptors." 4858. April 13th, 1942. (550975.)

H. C. Pritchard & J. W. Barnes.—" Gyroscopic apparatus." 3910. March 22nd, 1941. (551079)

E. G. Ritchie.—" Steam generating plant." 11045. August 29th, 1941. (551089.)

M. Rosenfeld.—" Transformer, choke, reactor and the like having adjustable reactance." 6788. May 19th, 1942. (550976.)

Siemens Bros. & Co., Ltd., and E. W. Durkin. —" Electric signalling systems." 13206. October 14th, 1941. (551092.)

S. Smith & Sons (Motor Accessories), Ltd., V. J. S. Russell, and E. B. Moss.—"Electrically wound clocks." 8239. June 30th, 1941. (550982.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).— " Electrodes for vacuum discharge tubes." 976. January 23rd, 1942. (550972.)

A. H. Stevens (Electronic Laboratories, Inc.). —" Electrical systems for transforming direct current into alternating current." 3626. March 18th, 1942. (550974.)

P. W. Taylor.—" Electric accumulators." 9202. July 21st, 1941. (550951.)

Telephone Manufacturing Co., Ltd., and G. E. Taylor.—" Ceiling or pull operated switches." 11046. August 29th, 1941. (551020.)

Westinghouse Brake & Signal Co., Ltd., and D. Ashby.—" Apparatus for electrodeposition and the like." 9694. July 30th, 1941. (550985.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—COMMONWEALTH.—P.M.G.'s Department. March 23rd. Resistances and reactances (Sch. C.4008).

March 30th. Testing instruments, exchange service type (Sch. C.4036).

April 1st. Testing instruments, insulation and resistance testers (Sch. C.4035).

April 8th. Jacks (Sch. C.4016).

(See February 5th for other items).

Irlam.—February 27th. Urban District Council. Lamps for the year ending March 31st, 1944. Forms of tender from the engineer and surveyor, Council Offices.

Londonderry.—March 1st. Town Council. House service cut-outs, joint box compound, meters, electrical accessories, electric kettles, transformers and kiosks, cables and cable covering tiles. Specifications, etc., from the borough electrical engineer.

Orders Placed

Altrincham.—Town Council. Accepted. Installation of refrigerating equipment, electric wiring, etc., at the Public Mortuary (£546).—Asco Refrigeration, Ltd.

Durham.—County Council. Accepted. Electrical installation at Alderman Wood secondary school (£641).—W. E. Dove & Co.

London.—Metropolitan Water Board. Accepted. Cable for borehole (£136).—W. T. Henley's.

Rotherham.—Town Council. Accepted. Laying new 11-kv feeder cable with reactor.—Telegraph Construction & Maintenance Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bedworth.—Houses, York estate and Blackhorse Road site; N. D. Martin, U.D.C. surveyor, Newton Road.

Boston.—British Restaurant at Butterwick; C. Dawson, R.D.C. surveyor, Market Place.

Bromsgrove.—Hotel, Lickey Rock; J. L. Kimberley, 30, Little Moor Hill, Smethwick.

Shops and offices, Market Street and High Street; Jackson & Edmonds, architects, 17, Easy Row, Birmingham.

Caernarvonshire.—School, Maesgeirchen; W. Ll. Jones, county architect, Caernarvon.

Caernarvon.—Houses, Cae Chapel and Cefnhendre estates; H. Evans, borough surveyor, Guildhall.

Carlisle.—Fire station; city engineer, 18, Fisher Street.

Cheshire.—Extensions to mental colony; county architect.

Clayton.—Works kitchen; McCutcheon & Walsingham, architects, 1180a, Chester Road, Stretford.

Coventry.—Experimental houses, Lythall's Lane; D. E. Gibson, city architect, 1a, Warwick Row.

Crewe.—A.R.P. depot, Rook Street (£1,119); Parker Bros.

Kent.—Canteens and youth centres (£50,000); county architect, Maidstone.

Leicestershire.—Two miners' canteens; Architects' Department, Miners' Welfare Commission, Ashley Court, Ashtead, Surrey.

Lleyn.—Houses (22) for R.D.C.; J. E. Turner, surveyor, Council Offices, Pwllheli.

London.—ISLINGTON.—Nurseries, Canonbury Place (£1,475) and Green Lanes (£1,342); C. Bundock, Ltd., and F. Bowles.

CAMBERWELL.—Nursery (£2,338), Peckham Park Road site; J. Harrison (London), Ltd., contractors, Denmark Road, Brixton.

Manchester.—Works extensions; David Moseley & Sons, mackintosh and raincoat manufacturers, Chapelfield Works, Ardwick.

Middlesbrough.—Extension of school canteens (£16,800); and a child welfare clinic; Cecil Gorman, borough engineer, Municipal Buildings.

North Riding.—Farm cottages (80) under Ministry of Health scheme; county architect, Northallerton.

Northumberland.—Extensions to the county laundry at Backworth; county architect, County Hall, Newcastle-on-Tyne.

Northwich.—Orthopædic clinic block at Victoria Infirmary; Powles & King, architects, Winnington Lane.

Oswestry.—Houses (14) for R.D.C.; C. B. Barnes, surveyor, Bailey Head.

Paisley.—Crematorium at Hawkhead cemetery; burgh surveyor.

Patricroft.—Works extensions; Brookes Bros.; builders, 40, Ellesmere Street.

Solihull.—Extensions to County Hospital (£13,787); J. R. Deacon, Ltd., Lichfield.

Tarvin.—Houses (16) for R.D.C.; T. Pritchard, surveyor, Westminster Buildings, Newgate Street, Chester.

West Hartlepool.—Junior and infants' school (pre-fabricated huts); Francis Durkin, borough engineer, Municipal Buildings.

Wigan.—Rebuilding candle factory, Jackson Square; J. C. Martin, Little Croft, Robin Hood Lane.

Office, Darlington Street East; English Tools, Ltd., 15, Wiend.

Wingate.—Miners' canteen; E. M. Lawson, Barras Buildings, Barras Bridge, Newcastle-on-Tyne.